THE AMERICAN GAS LIGHT JOURNAL

PUBLISHED WEEKLY, AT No. 42 PINE STREET.

VOLUME CI., No. 22. Whole No. 2,060. | NEW YORK, MONDAY, NOVEMBER 30, 1914. | Subscription, $3 Per Year. $4 Canada, $5 Foreign.

INDEX TO CONTENTS, PAGE 337 . . . . . ADVERTISERS' INDEX, PAGE 18.

LIBRARY OF CONGRESS NOV 30 1914 SMITHSONIAN DEPOSIT

Riter-Conley Manufacturing Company

STEEL CONSTRUCTION

Pittsburgh

THE UNITED GAS IMPROVEMENT COMPANY,

PHILADELPHIA.

—•—

BUILDERS OF

THE STANDARD DOUBLE SUPERHEATER

LOWE WATER GAS APPARATUS.

—•—

ACCURATE MEASUREMENT

OF

AIR AND STEAM SUPPLY

(PATENTED),

AFFORDING { PERFECT CONTROL OF GENERATOR FIRE CONDITIONS.

PRODUCING { UNIFORM RESULTS. HIGHEST EFFICIENCIES.

THE AMERICAN
GAS LIGHT JOURNAL
INC

VOL. CI., No. 22. NEW YORK, NOVEMBER 30, 1914. WHOLE No. 2,060.

GAS RATES.

FLAT-RATE UNFAIR TO COMPANY AND CONSUMER.

By J. E. Bullard.

There is at present a great deal of abstract talk about rate-making; but not a great deal, in fact probably not enough, concrete talk. In this paper I will endeavor to point out in as clear and concise a form as possible, some of the disadvantages and some of the advantages of different rate systems.

The *Electrical World* of November 7, 1914, in commenting editorially on the report of the Committee on Rates of the American Gas Institute, made the following statements: "With the urban electric railway, the gas company has clung to the flat rate, when other privately-owned public utilities have found promise and prosperity in advanced methods. Steam railroad, long-distance interurban electric railway, electrical central station, and telephone have thrived financially and physically on rate-making proportioned according to cost or value of service. Decreasing rates for gas, due to city agitation and commission and court decisions, make the issue more acute for companies now than in the earlier days of the industry. This consideration compels action even if the commercial possibilities of better rate-making do not."

It is evident from this that the electric industry considers the gas companies' condition in regard to rate-making as quite serious. It is also evident that it believes the gas industry has lost a great deal by continuous ultra conservatism in rate-making. The electric industry has already passed through the rate-changing period and is beginning to standardize scientific rate systems. A glance at the last census reports shows very clearly how much it has prospered financially by progressive rate-making. Electric light companies have accomplished more in the past thirty years than the gas companies have in one hundred; and it has not been proven that the gas companies have not had as great opportunities.

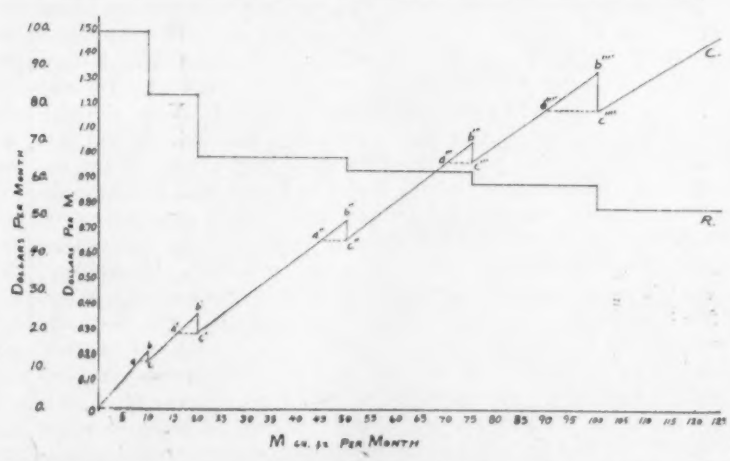
All of the material given here is the result of experience; some gained with electric lighting companies and some with gas companies. In order that the discussion may be clearer, curves for five systems have been plotted. These systems are: The old style flat rate, Fig. III.; step rate, Fig. I.; sliding scale rate, Fig. II.; readiness to serve rate, Fig. III.; maximum demand rate, Fig. IV. In each cut the curve marked "C" is the consumptive curve and represents the monthly bill for gas; the curve "R," the rate curve, representing the rate per 1,000 cubic feet of gas consumed.

We will first consider the "step rate" given in Table I. and plotted in Fig. 1. The most glaring defect in this system is the presence in the consumption curve of what may be termed triangles of dissatisfaction, shown at *a*, *b*, *c*; *a'*, *b'*, *c'*, etc. Where such exist there is bound to be more or less dissatisfaction and loss of business. Take, for instance, the case of a consumer averaging about 100,000 cu. ft. of gas per month. If during some month he does not watch his meter closely and uses only 99,000 cubic feet he will have to pay $89.10. Had he watched the meter, and when he discovered that he would not use over 100,000 cubic feet before the arrival of the meter reader, had opened a gas cock and allowed 2,000 cubic feet to escape, he would have been charged only $80.80. In other words the gas company appears to be willing to pay him $8.30 to waste 2,000 cubic feet of gas.

TABLE I.—Fig. I: *Step Rate.*

Monthly Consumption.	Rate at Which Total Monthly Consumption is Charged per 1,000 Cubic Feet.
1,000 to 10,000 cubic feet.....	$1.50
10,000 to 20,000 "	1.25
20,000 to 50,000 "	1.00
50,000 to 75,000 "	.95
75,000 to 100,000 "	.90
Over 100,000 "	.80

Consumer can gain by wasting gas at the "triangle of dissatisfaction" shown in the diagram.



It is hard to explain to a consumer why such a rate is used, and some will have so poor an opinion of a company using such crude business methods that they will not use anywhere near as much gas as they would were the methods more progressive. It is very hard to explain why a gas consumption between 88,000 cubic feet and 100,000 cubic feet should cost no more than a consumption between 100,000 cubic feet and 112,000 cubic feet. As the consumption curve shows, a consumer can use several thousand more cubic feet after his consumption reaches the apex of any of the "triangles" without increasing his bill. In fact he is given an incentive in the shape of a material discount on the bill, to use some more. As far as the writer has been able to learn this rate system causes more complaints and general dissatisfaction than any other system ever adopted by a gas or electric company.

The sliding scale rate shown in Table II. and Fig. II. has been in

NOTE: For Table of Contents see Page 352.

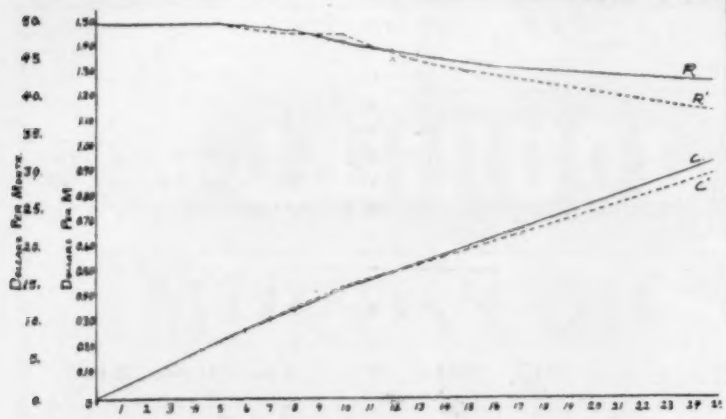


Fig. II.—Comparison of Two Sliding Scale Rates.

TABLE II.—*Sliding Scale Rate with too Many Steps.*

First 5,000 cubic feet	$1.50	per 1,000
6,000 "	1.45	"
7,000 "	1.40	"
8,000 "	1.35	"
9,000 "	1.30	"
10,000 "	1.25	"
11,000 "	1.20	"
12,000 "	1.15	"
All over 12,000 "	1.15	"

use for several years by a gas company, but has far too many steps. It is confusing to the public and it has been found necessary to make up a table giving all the consumptions from 100 cubic feet up to 12,000 in steps of 100 with the amount of the bill opposite each consumption, in order to prevent bookkeepers making a great many mistakes in figuring total bills. A rate like the one following would have arrived at practically the same results. It appears lower, but as shown in the curves *C'* and *R'* (Fig. II.) it is in some cases actually higher, and is only lower for the larger consumers where a lower rate is profitable and will result in more business. This rate is simple and does not, as in the case of the rate shown in Table II., require a great deal of time in explaining it to the consumer. The rate is: The first 5,000 cubic feet of gas used per month to be billed at $1.50; the next 5,000 to be billed at $1.40; and all in excess of 10,000 cubic feet used in any one month to be billed at $1. A comparison of these two rates shows the necessity of plotting rates and carefully studying before they are actually adopted. Very often an apparently complicated rate can be greatly simplified. When it is plotted on cross section paper, the formula of its curve, or of a curve which very closely approximates it can be found, and this formula can usually be expressed in dollars and cents in very simple terms.

The great weakness in the foregoing rates is that they do not take into consideration the cost of supplying the consumer. Under these rates a consumer could use 101,000 cubic feet of gas during a period of five hours and not pay any more for it than one who used the same quantity by keeping his equipment in continuous and uniform operation for 700 hours. In the first case the company would have to make preparation in mains services, etc., for a demand of at least 20,200 cubic feet per hour; in the second, the demand being less than 150 cubic feet per hour, no great additional expense would be incurred. In the first case, very large and expensive meters must be provided; in the second, an ordinary house meter will meet the requirements. In short, it costs a great deal more to supply the first consumer, though he is not required to pay the company any more than the other, where the cost to the company is relatively small. Looking squarely at the proposition, one is forced to conclude that this rate is unfair either to the company or to the long-hour consumer.

The "Hopkinson or Doherty rate" takes into consideration the demands of the consumer, and distributes the charges in such a way that each customer pays the exact cost of the service rendered him, plus a reasonable profit. The rate is made up of three charges. The "customer charge" includes those costs peculiar to each consumer regardless of his consumption—such items as meter-reading, bookkeeping, etc. The "readiness to serve," or "demand" charge, is made up of the costs incident to the size of the consumer's maximum demand, and includes all fixed charges not covered in the customer charge. The "energy charge," or the cost of making the gas the consumer uses. The theory of this rate is that each consumer should pay his share of the fixed charges, and the only practical way to accomplish this appears to be to charge fixed costs separately.

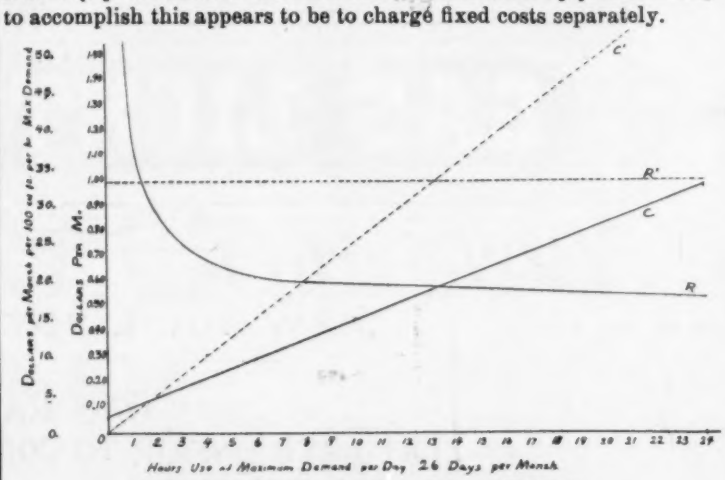


Fig. III.—Readiness to Serve Rate and Flat Rate.

This plan is often figured with only two charges, the customer charge being included in the readiness-to-serve charge, so that we have only the readiness-to-serve charge and the energy or consumption charge. It is safe to say that any company now selling gas at a flat rate of $1 per thousand cubic feet, and meeting expenses, could with profit sell at the rate shown in Fig. III. This has a readiness-to-serve charge of $2 per month for each 100 cubic feet per hour of maximum demand, and a consumption charge of 50 cents per thousand cubic feet consumed. As will be seen by a comparison of the curves *C* and *R* (the readiness-to-serve rate curves) with the curves *C'* and *R'* (the $1 per 1,000 cubic feet flat rate curves), the readiness-to-serve rate is higher for all consumptions up to forty hours' use of a 100 cubic feet maximum demand. The average gas kitchen, consisting of a 4 burner range and a tank water heater, has an actual maximum demand of about 150 cubic feet per hour if much cooking is done. Forty hours' use of this would equal a consumption of 6,000 cubic feet, which is a consumption considerably higher than many gas kitchens. This would cost the consumer $6 under either rate, but if he used less the flat rate would be lower than the readiness-to-serve rate. The readiness-to-serve rate, if figured out scientifically for the undertaking under consideration, represents exactly the same percentage of profit for all consumptions and for all classes of business. Assuming this to be the case with the rates plotted, we discover that all the short-hour gas consumers are an actual loss to the company. That they are a loss is already pretty well proven, but it is impractical, as a rule, to increase the rate for such consumers and make them self-supporting.

The main objection the consumer makes against the readiness-to-serve rate is that he must pay $2 per month per hundred cubic feet per hour maximum demand, whether or not he uses any gas, and that the $2 pays for no gas. Of course, in the actual operation of the rate, this charge is no hardship to him, although he imagines it is. To educate him it is necessary to use curves like those in Fig. III and tables like Table III. This table shows conclusively that the rate the consumer pays is entirely in his own hands. If he uses his gas only one hour per day he will have to pay $1.269 per 1,000 cubic feet for it. The more hours per day he uses it the less he pays, until, if he uses it every hour of the month at the full capacity of his equipment, he will have to pay only 52.7 cents per 1,000 cubic feet.

It is this style of rate that the electric lighting companies have used to secure practically all their big business. In some cases they use somewhat higher readiness-to serve charges, and lower energy charges. The readiness to-serve charges for electricity vary from an equivalent of $1.50 per 100 cubic feet per hour of maximum demand to $3, while the energy or consumption charge is the equivalent to from 20 cents to 40 cents per 1,000 cubic feet. At the start, gas companies will have to be conservative. They could begin with the rate shown in Fig. III., and later, as conditions warranted and more and better business could be secured, could reduce the consumption charge. Any experienced gas company salesman will at once see how easy it would be to secure a great deal of business at present just beyond his reach, if he could use a rate like this.

In order that one rate may apply to all classes of business, and because many consumers are getting gas at less than cost and their rate cannot be raised; a maximum demand system like that shown in Fig. IV. may be used. This rate was obtained by finding the point of in-

TABLE III.—*Showing Dollars per M and Dollars per Month per* 100 *Cubic Feet of Maximum Demand.*

Days per Month.	Hours Use of the Maximum Demand — Hours per Day.	Hours per Week.	Hours per Month.	Hours per Year.	Dollars per M.	Dollars per Month per 100 Cu. Ft. of Maximum Demand.
26	1	6	26	312	$1.269	$3.30
	2	12	32	624	0.884	4.60
	3	18	78	936	0.756	5.90
	4	24	104	1,248	0.692	7.20
	5	30	130	1,560	0.653	8.50
	6	36	156	1,872	0.621	9.80
	7	42	182	2,184	0.609	11.10
	8	48	208	2,496	0.596	12.40
	9	54	234	2,808	0.585	13.70
	10	60	260	3,120	0.576	15.00
	11	66	286	3,432	0.569	16.30
	12	72	312	3,744	0.564	17.60
30½	12	84	364	4,368	0.555	20.20
26	13	78	338	4,056	0.559	18.90
	14	84	364	4,368	0.555	20.20
	15	90	390	4,680	0.551	21.50
	16	96	416	4,992	0.548	22.80
	17	102	442	5,304	0.545	24.10
	18	108	468	5,616	0.542	25.40
	19	114	494	5,928	0.540	26.70
	20	120	520	6,240	0.538	28.00
	21	126	546	6,552	0.536	29.30
	22	132	572	6,864	0.535	30.60
	23	138	598	7,176	0.533	31.90
	24	144	624	7,488	0.532	33.20
30½	24	168	728	8,736	0.527	38.40

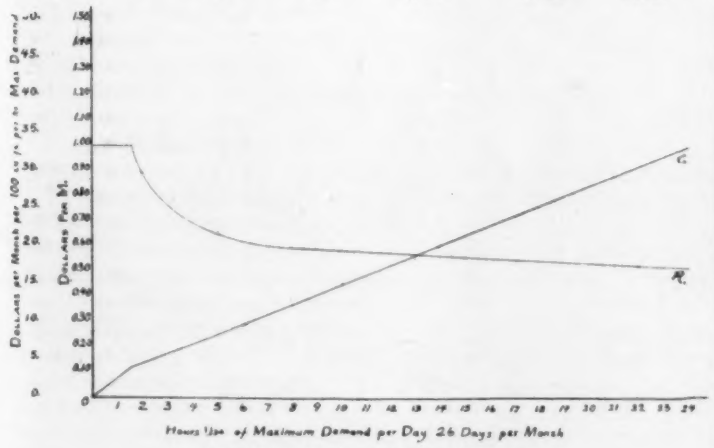


Fig. IV.—Maximum Demand Rate.

tersection between the old flat rate and the readiness-to-serve rate. (In this case at the 40 hours per month point.) A rate made up as follows will have the same curve below $1 per 1,000 cubic feet as the readiness-to-serve rate, and will have the advantage of no points above the old flat rate. The rate is $1 per 1,000 cubic feet for the first 40 hours use of the maximum demand per month, and all in excess of 40 hours use at 50 cents per 1,000 cubic feet. Some such form of rate could be adopted by practically every gas company, and just as certain as it has proven extremely profitable to electric light companies, the use of such rate will prove profitable to gas companies. The minimum maximum demand should probably be put at 100 cubic feet per hour, and it would likely be best to figure demand above 100 cubic feet per hour in multiples of 50 cubic feet per hour. Until more accurate and cheaper instruments are on the market for measuring small maximum demands they could be determined by the sum of the demands of the different appliances, by the size of the meter or by a combination of these two methods. For the very large installations that every gas company will make as soon as scientific rates are adopted, a venturi meter, which gives a complete history of the use of gas might be used. In this meter the consumption curve would give the maximum demand, and the integrating apparatus would give the total consumption.

This is an opportune time for commercial men and engineers in the gas business to give the matter of rates careful study. It might be suggested that the new business manager consult the engineer, and the engineer consult the new business manager before either recommend any certain rate. Neither the engineer nor the new business manager is capable of determining on as good a rate by himself as he when working with the other. The engineer can see the manufacturing objections to a rate, while the new business manager can see those of the consumer. As many objections as possible should be eliminated before any rate is adopted. If this is done the very best rate for the particular undertaking will be arrived at. When such a rate is adopted the same phenominal increase in profitable business may be expected as the electric central stations have experienced the past 10 or 15 years.

Purifier Installations.[1]

[Written for the Ninth Meeting, American Gas Institute, by C. E. PAIGE.]

The purification of illuminating gas is being given constantly increasing attention. At present, it cannot be said that purification methods are capable of standardization. In many plants impurities are removed by methods which would be impracticable in other plants.

In the early days, manufactured gas was chiefly produced by the destructive distillation of coal in retorts, and the disposition of the coke was about the only simple matter that presented itself to the gas manufacturer. The other residuals presented real problems. The removal of sulphur compounds had not presented itself, and it was not, in fact, until a comparatively few years ago that purification required serious attention. Everyone is familiar with the unpleasant odor from burning illuminating gas containing any great quantity of ammonia or sulphur, and from the service point of view, therefore, it is essential to keep these impurities at a minimum. The problem has become of increasing importance because many companies are obliged to use coals containing a considerably greater quantity of sulphur than was common years ago. For many years, there has been a tendency toward public regulation of the quality of gas, and a great number of cities and States have specific laws or ordinances relating to the matter.

When the necessity for purification of gas from sulphur compounds was first recognized, the use of slaked lime was common. This was satisfactory when low sulphur coals were used, and where economy was not important. With the constantly decreasing price of gas to consumers, there has been a constant effort on the part of gas engineers to cut down production costs. The possibilities of savings in the cost of purification was soon apparent. Where originally costs were measured in cents per 1,000 feet of gas made, purification is not now considered economical unless it is reduced to tenths of cents. Lime for purification has been superseded quite generally by oxide of iron, and it is likely that sulphur compounds will ultimately be removed by some process of washing.

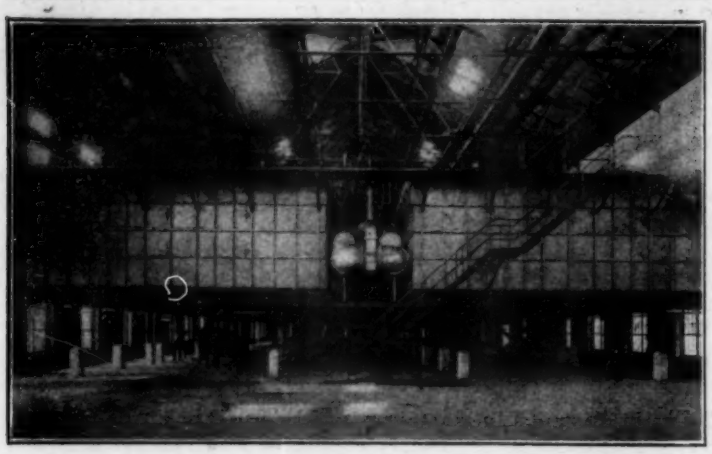
Many papers have been written on methods of economical purification of gas. We are, in the present discussion, concerned with "Purifier Installations."

When purifier installations began to be important items in the cost of a gas plant, boxes of cast iron were commonly used, usually with sheet iron covers stiffened with angle irons. Boxes were usually 4 in a set, controlled by a center seal valve. Covers were of the wet seal type, the sides dipping into a channel filled with water.

The center valve answered its purpose very well, but it has been largely discontinued because of the difficulty in keeping the joints sufficiently gas-tight to prevent the gas by-passing from one section to another. Perhaps a greater objection is that only 3 boxes out of 4 can be kept in operation, one always being "out" for cleaning. The gate valve system permits of keeping all 4 boxes in operation except for the time of emptying and refilling. In this way maximum purification is accomplished, and the largest possible proportion of the investment continually kept in use.

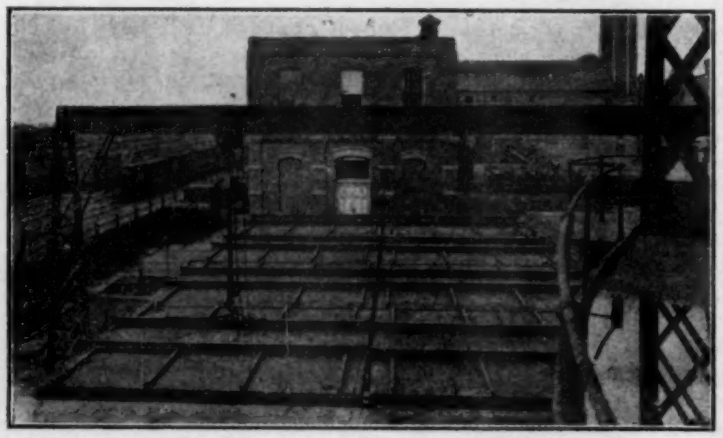
The purification of gas is essentially a question of chemistry, and anyone who thinks that any present process is final exhibits a lack of imagination. Sulphur exists in gas in various forms, all objectionable, and oxide removes effectively only one of them. If a process is discovered that will absorb all forms, or convert one form into some other readily absorbable by a liquid as ammonia is absorbed, we would have nearly an ideal method, because liquid and gas can be brought into contact with small apparatus and at minimum expense. So far as such processes have been developed, they depend upon such delicate balances that skill is necessary for their operation.

1. Slightly abridged.—EDS.



(No. 4) Cast Iron Boxes.

We find oxide purifiers of all types and descriptions throughout this country—cast iron, steel, rectangular and circular, inside and outside of buildings; and in the West, some made of wood. Unquestionably the local conditions determine the type of installation.



(No. 8) Concrete Boxes.

Malden Installation.—Some time ago the purifying capacity at Malden, Mass., required extension. The plant had an average output of 1,700,000 cubic feet per day (900,000 coal gas and 800,000 water gas). The purifying equipment consisted of two sets of apparatus. First, 4 boxes 24 feet by 20 by 3 feet deep connected with 16 inch pipes and operated by a center seal, and rated at 750,000 cubic feet per day, but frequently there were hours when double this quantity had to be passed. The other installation was 5 cast iron boxes 25 feet by 25 by 5 feet 10 inches deep, with 20-inch connections; 4 of them were controlled by water valves. The fifth box was designed as a lime box, and had ordinary gate valve connections. These boxes were of the dry lute type, while the first set were of wet seal construction. Both sets were arranged in a row. For the smaller installation, the oxide is raised to the upper floor by an elevator, and wheeled to the boxes; an expensive way of handling material. A bucket elevator with a corkscrew conveyor was tried, but it pulverized the oxide to such an extent that back pressure troubles were frequent. In the larger installation the hydraulic elevator is supplemented by a conveyor system. About 2 feet below the floor level on the lower floor, there is a belt that feeds a bucket conveyor, which lifts the oxide to a distributing belt above the boxes. This apparatus is satisfactory with manufactured oxide, but using natural ore, we had trouble with the material clinging to the belt.

Our principal consideration in planning the extension was ground space and investment. We had a definite area in which boxes could be located and wished to get maximum purifying capacity. In working out purifying capacity we used the formula in Catechism for Gas Engineers, which is only an approximation, because the condition of the oxide, and sulphur content of the gas should be considered.

In deciding upon form of installation, we reasoned thus: We are looking for the installation best suited to our conditions. Essentially a purifying box is only a container of material. Other things being equal, it would be efficient according to its area and depth, whether built of steel, cast iron, wood or concrete; circular or rectangular.

The efficiency of the oxide being considerably influenced by temperature, it is important that this be maintainable, and it is not of consequence otherwise, whether the boxes are inside or outside of a building, or heated from the inside or outside, or not heated at all, if the gas is hot enough to maintain the temperature of the oxide.

We had conditions of investment to consider. Outside purifiers have an advantage, requiring no elaborate building; they are safer to operate, as changes are made in the open air and there is much less danger of asphyxiation.

The question of design is more complex. The gas passes through a loose spongy material; and it is important that it pass through the entire mass; the material should be distributed uniformly so that there will be uniform resistance, resulting in an equal rate of flow through the entire area. If the material is loaded into the box from a single point, such as an elevator spout, there is necessarily a tendency to compact the material immediately under the spout. It is important, therefore, that the distribution of oxide insures equal density with the least requirement for supervision of the workmen. For these reasons, we believe the whole top of the box should be removable.

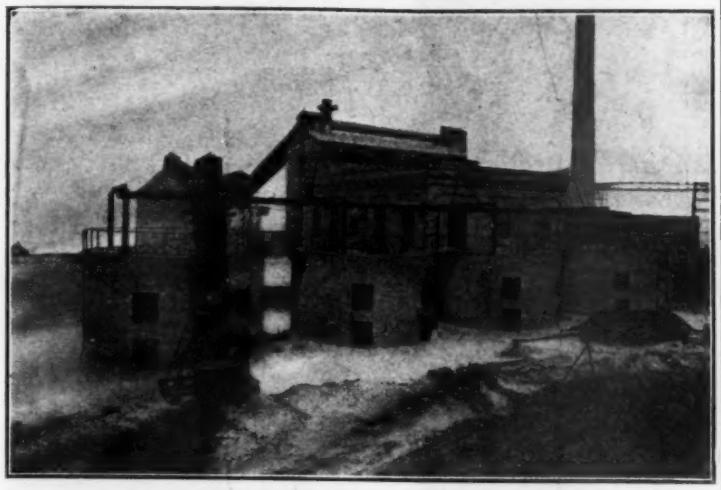
Rectangular steel boxes present the difficulty of sides bulging in spots and thus let the gas slip up past the oxide. All steel construction is easy in circular form. Cast iron is expensive and where exposed to local temperature changes, is liable to crack, but has longer life in the presence of oxide. The question of materials is, therefore, one of expediency. To avoid a building we must consider some form of insulation for the boxes; we wished to take advantage of the insulation of the ground, but we could not very well bury metal structures. This led us to consider concrete.

The first qbestion was how often it would be necessary to change the material in the boxes, and an economical way to do it. If the changes must be made frequently, some mechanical means would be necessary. If the oxide handling apparatus would be used only six or eight times a year, maintenance and depreciation would probably more than offset the saving in labor. For the present, therefore, we decided to remove the oxide by shovelling; and that the top edge of the box should be only far enough above the ground to be filled by wheelbarrows. In order to attain maximum purifying capacity for the area, we concluded to make the boxes so deep that they would require two stage shovelling for unloading. We felt that this would be economical because frequent changes would not be necessary.

Another very important consideration is the connections. With underground boxes the connections take up little space, and have the advantage of natural insulation. The next question was what objection there could be to concrete. We had been led to believe that concrete, properly mixed, becomes harder as time goes on. The only serious objection is the possibility of leaking. We know that to make concrete water tight, the material must be carefully prepared and carefully placed. To make it air tight is even more trouble—to make it gas tight we know requires the greatest possible care, but we also know that it has been done. With concrete boxes in the ground, we felt the risks from corrosion or bulging were minimized, and if, for any reason, they should crack, they could be patched with cement. Heavy concrete walls partly buried give a natural insulation, and heat losses cannot be serious except from the exposed top. Then there is the question of safety. Serious accidents have occurred with various types of boxes in houses. It is fair to assume that there is as great liability of accident in one type of box as another, but the resultant dangers are reduced if the box is in the open. We finally concluded to build concrete boxes. Four of these 25 feet by 30 by 10 feet deep, gave us an installation with sufficient room at the side of the boxes for handling oxide. The boxes have 20-inch connections, and a direct vaive gate system. The walls of the boxes are 2 feet thick, except where they adjoin another. and in this case, they are 12-inch thick with a pitch-filled space of ½-inch between them. The soil was coarse sand giving a good bottom for the concrete. The bottom of the boxes are 9 inches thick. We concluded that, although more expensive, it would be wise to have the boxes cast all at one time; in other words, to make a monolith.

When the forms were completed, concreting was started and kept up continuously until the box was finished. To secure dense concrete, a mixture of 1-3-5 was used. Two pounds per square inch was agreed upon for test purposes, applied at sundown when there would be a minimum contraction or expansion from heat, and to be sustained for a half hour, with a loss of not more than one-eighth of a pound. The covers were reinforced with 15-inch I beams, and of the dry lute type, the gasket coming down on an I beam imbedded in the wall. The first tests were disappointing, as we found it difficult to hold up any pressure at all. We then directed our effort to making

one box tight before experimenting on the others. Various waterproofing compounds were used without success. Finally the inside surface of the box was chipped, a ¾-inch layer of neat cement applied with trowels, and after this had set a coating of pitch was put on.



(No. 16-a) Note Oxide Elevator. These Boxes are Insulated with a 9-Inch Brick Wall, 2 Inches from the Steel, the Granular Space Filled With Ground Cork. Covers Insulated with Slab Asbestos.

The boxes were for water gas purification, and we knew that the oils in the water gas would probably cut the pitch; but we felt that the pitch coating would gradually be replaced by a coating of water gas tar and oil, which penetrate more deeply into the concrete and insure greater tightness. This box passed the test successfully. The others were treated the same way, except that the pitch was not applied. The boxes have been in use for more than a year. The inside surfaces are coated with water gas tar and oil, and are now a dull black; and we are unable to observe any leakage.

These boxes have four layers of trays, and inlet and outlet ducts so arranged that the gas may enter at the middle and go up and down through the oxide; or enter at top and bottom, and leave at the middle; or enter at top and botton, and leave at the point opposite.

In comparing investment costs the fairest unit to take of installations seems the cubic feet of oxide capacity. From the cubical contents of these boxes, allowing 20 per cent. for beams, trays, ducts, etc., we find the cost of the installation per cubic foot of net oxide capacity is slightly more than 84 cents.

The above information applies specifically to the recent installation at Malden, and it is felt that a comparison of other types of boxes may be interesting. Accordingly a series of questions was sent to a great number of gas companies, and many replies were received. The companies that furnished information are identified only by number, as are also the photographs shown.

Some of the questions asked, with typical answers, were as follows:

	Are Boxes Inside or Outside of Buildings.	Steel, Iron or Concrete.	Circular or Rectangular.
1.	Inside.	Cast iron.	Rectangular.
2a.	Inside.	Cast iron.	Square.
2b.	Outside.	Steel.	Square.
3.	Outside.	W. G. steel.	Circular.
	Outside.	C. G. steel.	Rectangular.
4.	Inside.	Cast iron.	Rectangular.
5.	Inside.	Cast iron.	Rectangular.
6.	Inside.	Cast iron.	Rectangular.
7.	Outside.	Steel.	Circular.
8.	4 Inside.	Cast iron.	Rectangular.
	2 Outside.	Concrete and steel.	Rectangular.
9.	Inside.	Cast iron.	Rectangular.
	Outside.	Steel.	Circular.
10.	Inside.	Cast iron.	Rectangular.
13.	Inside.	Cast iron.	Rectangular.
14.	Outside.	Steel.	Circular.
16.	Outside.	Steel.	Circular.
17.	3 Inside.	Cast iron.	Rectangular.
	1 Outside.	Steel.	Circular.
19.	Outside.	Steel.	Circular.
20.	Inside.	Cast iron.	Square.
25.	Inside.	Steel.	Circular.
41.	Outside.	Concrete.	Square.

	Number of Boxes and Inside Dimensions.	If Steel or Iron, Thickness of Metal.	If Concrete, Thickness of Walls.
1.	4—8′ x 5′ x 3′	¼″	
2a.	24—40′ x 40′ x 8′2″.	¾″ & ⅞′	
2b.	8—34′ x 34′ x 13′3″	7/16″ & ⅜″	
3.	3—21 diam. x 11′ deep.		
	4—30′ x 20′ x 4′.		
4.	8—30′ x 36′ x 8′.	5/16″	
	4—21′ x 35′ x 12′.	—	
5.	4—16′ 10″ x 12′ 10″ x 3′–10″.		
6.	4—20′ x 35′ x 10′.	¾″	
	4—23′ x 30′ x 7′6″	¾″	
7.	3—21′ diam. x 11′6″ deep.	5/16″	
8.	4—25′ x 20″ x 6′	1″ & ⅜″	
	2—40′ x 40′ x 16′		46″ & 18″ Exp. metal reinf.
9.	20′ x 20′ x 7′	5/16″	
	21′ x 11′	5/16″	
10.	20′ x 20′ x 11′.	1″ & 1¼″.	
13.	40′ x 40′ x 10′.	1″.	
14.	25′ x 12′.	¼″.	
16.	23′ x 12′.	¼″.	
17.	2—12′ x 12′ x 5′	1″.	
	1—20′ x 12′ x 12′.	1″.	
	1—21′ x 11′6″.	¼″.	
19.	4—17′6″ x 11′6″.	⅛″.	
20.	4—35′ x 35′ x 12′.	⅛″.	
25.	35′ x 9′.	¼″.	
41.	4—25′ x 25′ x 8′		2′6″ sides—1′8″ bottom.

Q. Give description of cover.

2a. Crowned one way, and stiffened by 13 internal angle iron trusses, 28 inches deep at center, holding down lugs secured on ends of 7 of the trusses. Holding down device consists of a parallel bar fastened to steel supporting structure, and provided at top with an eccentric roller, operated by hand lever; 36-inch water seal, with 32-inch break-seal boxes ahead of purifiers.

2b. Crowned one way, and stiffened with 5 internal lattice trusses, 3 feet 3 inches deep at center. Eleven holding down lugs on each side, hinged bolts with nuts used to secure cover.

3. Water gas boxes, circular flat cover, reinforced with radial I beams; square asbestos gasket used.

14. Covers all steel. Five 4 feet diameter manholes. Dry seal with red lead gasket.

16a. Steel circular cover 15 feet in diameter; ¼-inch steel plates riveted to angles inside of cover. Asbestos gaskets used, braided hemp to be tried.

22. Steel boxes, dry seal; bolted hatch of the marine type. Cast iron boxes converted wet seal to dry seal, by bolting cover down.

25a. Cover is in two parts; a movable cover 20 feet in diameter with an angle iron rim. The fixed top is the frustrum of a cone, the inside edge a Z bar ring, on which the movable cover rests.

25b. Cover built for dry seal.

25c. Rubber gaskets, and have been in use about 9 years. They will have to be replaced, and we will use special asbestos gaskets.

31a. Covers of 3/16 inch charcoal iron and 24 inch water seal.

32b. The top plate, No. 10 steel, covering the entire box, with 6 stiffeners, each of 2 angles with a web plate between. The sides are channels of sufficient depth to make joints at corners with end plates, and have flanges for bolting down. The end plates have angles for stiffeners, and flangs for bolting down. An internal angle encircles the top of the cover for holding fast the sides and top; ties are provided on interior to hold cover in shape. Dry seal with ¾ inch square asbestos packing will operate at a pressure of 34 inches of water.

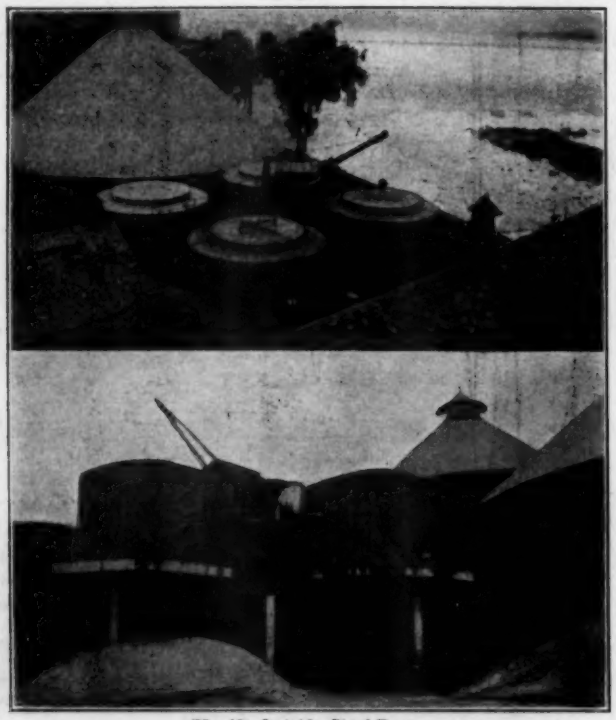
36. Top has 4 round doors, 5 feet in diameter, and 2 rectangular doors on side of box. Dry sealed with cotton packing and red lead. The boxes tested to 30 pounds, but operated at less than 1 pound.

37. Covers of steel, dry seal, with ⅜ inch asbestos gaskets, with interwoven copper mesh. There are 2 blow-offs, with test cocks bolted to top of each cover.

Q. (*a*) How many layers of purifier material used? (*b*) In what manner are trays supported? (*c*) Does gas pass up through all the material, or are the boxes designed for divided flow? (*d*) Are connections designed for reversing flow of gas?

In practically all cases the number of layers depends upon the depth of the boxes. The minimum layer of oxide reported was about 2 feet; the maximum 4 feet.

In smaller installations, particularly those of earlier type, the gas



(No. 19) Outside Steel Boxes.

passes up through the oxide, with means for reversing the flow. In larger boxes the flow is divided, and in many cases direction of gas flow can be reversed.

Q. Describe method of revivification.

Practically the same method is used in all the companies. Very few use any handling machinery during revivification. The oxide is usually piled from 12 inches to 30 inches deep, and turned frequently.

In a few plants oxide is reclaimed by burning after it has absorbed its complement of sulphur.

Q. Are boxes loaded by machinery or by hand?

In practically all installations where boxes are 25 feet square or larger, there is apparatus for loading the boxes; and where boxes are above floor level, dumps are provided for unloading.

Q. If boxes are out of doors, describe method of protection, if any.

2b. The sides of the boxes are encased in hollow brick walls, 4½ inches thick, the covers are lined with wooden false ceilings, and exposed gas mains lagged with asbestos hair felt, roofing felt and canvas, about 2½ inches thick. A line of 1¼-inch steam pipe under each of the 3 layers, close to the walls of the box, making 3 squares of 130 linear feet each, connected in series. The idea is to use enough steam to prevent loss in temperature of the gas while passing.

8. Steam coils in covers of outside boxes.

9. Boxes are lagged and are surrounded with a 4-inch hollow brick wall, leaving an air space.

17. The outside box is surrounded by a one brick wall.

19. Box kept well painted.

41. Concrete boxes. Earth banked up around sides.

Q. In view of recent developments, would you advocate increasing capacity, by the same type of installation?

Almost without exception companies say they would use the same form; but many would eliminate the center seal and use a valve system, and convert wet seal boxes to dry seal.

Q. What is the approximate cost of box per cubic foot of net oxide capacity (allowing for displacement of tray supports, ducts, etc.), with and without a building?

Concrete boxes vary from 85 cents to slightly over $1.

Outside steel boxes from $1 to $1.25.

Inside cast iron boxes, without building, from $1.25 to $2.25; with building, from $2.30 to $3.40.

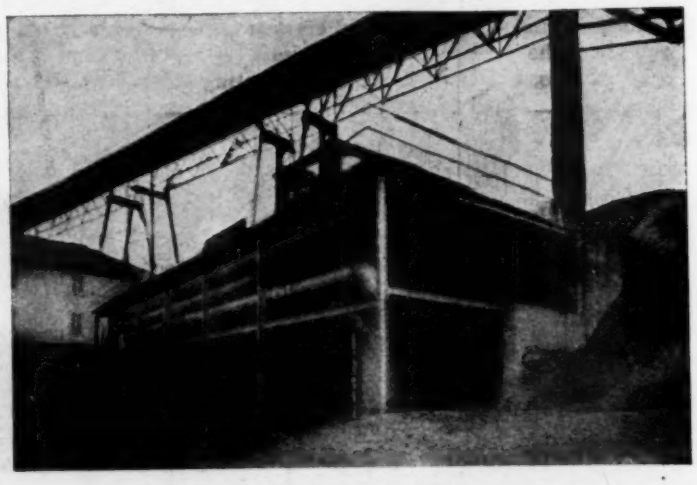
Q. On what basis is depreciation figured?

In one case boxes are steel containing ¼ per cent. copper, and it is expected that the depreciation will be very small.

In some cases no depreciation is figured, as the matter is taken care of under maintenance. The average depreciation is about 5 per cent.

Q. Have you State or municipal restrictions regarding purity of gas?

Practically every company reporting has either State or municipal restrictions, in some cases both.



(No 37) Note Angle of Bank and Character of Soil.

Q. Do you use purifying material of your own manufacture, or do you buy it?

The majority of companies make their own.

Q. Are your boxes equipped with perforated steam or water pipes to prevent fire or explosion when the box is opened? What arrangement have you? Can you suggest any accident prevention methods?

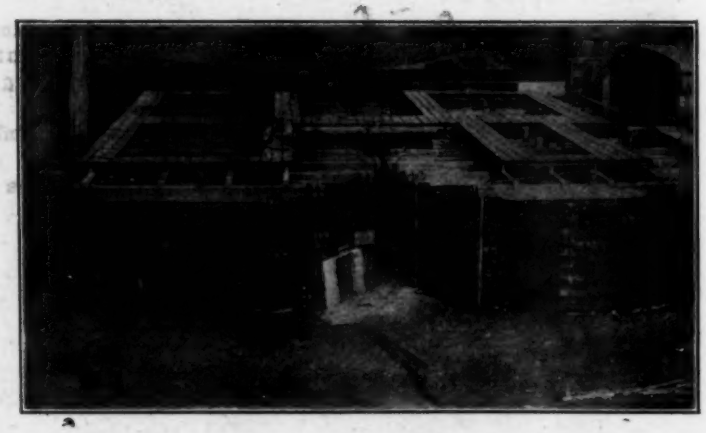
2a. Steam is introduced directly into the box below each of the two layers for 1½ hours after inlet and outlet valves are shut, and cap on cover removed, through one ¼-inch connection under lower layer and two between the layers. Do not consider introduction of steam in this manner of much service, and there is some question if it does not tend to cause local heating when material is dumped.

After valve boxes are closed, it might be advisable to displace the gas in the box with an inert gas, such as boiler flue gas, same being cooled before being pumped into box.

6. Steam jets into sides of boxes.

8. Perforated spray pipes for steam or water.

Use no lights about purifying equipment except electric lamps inclosed in marine globes. Prohibit lights (except as described) or fire within 100 feet of any box. Prohibit smoking within same distance. Have purifying equipment in charge of careful man. Have usual fire fighting material handy. Accidents are chiefly due to carelessness or laxity of rules.



(No. 43) Four Jones' Wood Purifiers. 30 Feet by 7 Feet 10 Inches.

13b. A ½-inch high pressure steam inlet under each oxide layer. A copious supply of steam on opening box filled with oxide.

14. Water hydrants adjacent to changing doors and fire holes.

16a. Does not feel that there is much fire risk in outside boxes, unless an attempt is made to revivify the oxide in place.

22. Accidents prevented by never allowing air in box from bottom. Fire hose is laid out ready to protect top of oxide in box. Dumping doors on bottom of box should have air tight connections extending through oxide, thereby preventing any air from circulating underneath oxide. Box cut out one day before dumping.

23. Steam connections to inside of boxes.

29. A single steam connection into bottom of box. No perforated steam or water pipes. Fire hose connected to water supply adjacent to each box. No exposed lights. Electric light wires in rigid conduits and marine globes on lamps.

To prevent asphyxiation accidents, building should be amply ventilated, and sufficient and unobstructed exit facilities provided. First aid appliances, oxygen tank, pulmotors, etc., should be accessible.

When revivification in the boxes is practiced, tubes should be in in the oxide throughout the area for insertion of thermometers, and regular observation of temperatures while revivification is in process, to detect in time any dangerous rise in temperature.

32a. No steam or water jets. Fire protection consists of hose connection from works fire system.

Concrete Purifiers at Malden.

The following suggestions are made:

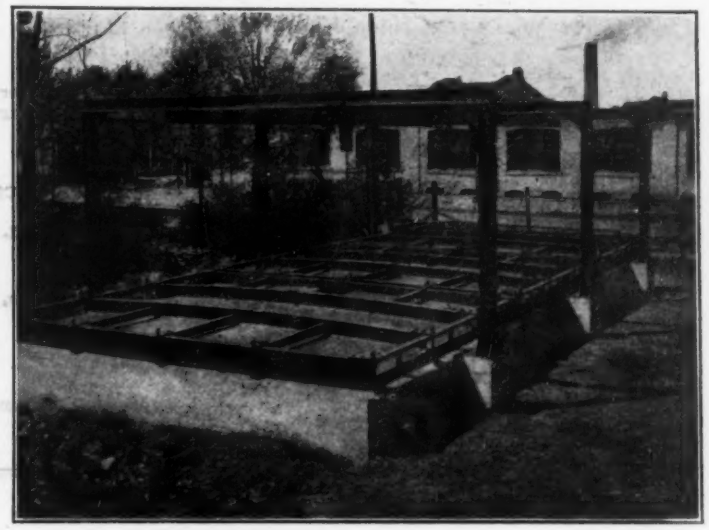
Plenty of light from windows in the daytime, and vapor-proof electric lights at night. Good ventilation. If boxes are of the cheese box type, sufficient number of roomy doors on the sides. Devices to prevent men's hands and feet from being caught and bruised by moving parts of cover-lifting carriage. Substantial runaways for wheelbarrows. Elevator safety gates.

38. Boxes have cast iron, sectional, flanged chutes, with a cover on top of each, extending up through the material from bottom openings.

(No. 11-b) An Early Installation of Concrete Boxes.

Unusual conditions have necessitated some unique installations. In one plant there are 2 purifying houses, one erected in 1887, the other in 1901. The former holds 8,20 feet by 24 feet boxes on 2 floors; the latter 2,30 feet by 30 feet boxes. The unusual feature is that the 20-foot by 24-foot boxes are on the second and third floors of the building, 4 boxes to each floor, one set directly over the other. This arrangement was to economize space, but it requires a building with abnormally heavy walls.

In California we find an interesting type of box. In 1904 it was decided to extend the purifying capacity at Oakland. It occurred to Mr. E. C. Jones that a tank of 2-inch redwood staves, with wooden bottom and top, fastened into the staves by chimes (the same as a barrel head) would answer the purpose for an outdoor purifier. The only difficulty was to obtain a redwood tank that would not dry up and fall to pieces. He found that the Pacific Tank Company made oil tanks of redwood staves, with groves running lengthwise of the staves, and a series of holes through the staves crosswise. These holes and grooves all terminated at a common inlet at the top of the tank just above the chimes, and by covering the top of the tank with about 2 inches of water it circulates continually through all the staves. Water is permitted to drop slowly on the top of the tank, and overflows into a drain at the bottom. This keeps the staves water soaked and the tank will last practically forever.



(No. 11-b) Typical Installation of Concrete Boxes for Small Plant.

Their first boxes were 30 feet in diameter and 9 feet deep, with flat hoops. These were afterwards changed to round steel hoops to avoid rusting and to facilitate painting. The tops of the boxes are heavily trussed, and the trusses anchored to railroad iron set in a concrete foundation. The first set of boxes were coated on the inside with paraffin, and then lined with canvas prepared with boiled linseed oil like balloon cloth. This was afterwards found unnecessary, the redwood tanks being gas-tight without any coating.

Practical Educational Courses for Gas Company Employees — Salesmen, Accountants, Office Men, and Commercial Managers.

The practical correspondence courses of the National Commercial Gas Association are made so simple and plain, both in the choice of principles and in the writing of the books, lectures and problems that anyone with an elementary education can understand them. Great care has been taken to connect every important principle of the gas business with a practical every-day business experience. The success of the student has been kept in mind every moment in writing these lessons. Only what a gas man need know to become a competent salesman, accountant, office man, and commercial manager, is taught.

The student wastes no time in wading through unnecessary reading. Every sentence will remind him of every-day experiences, and he will find many difficulties solved which before he had no means of knowing how to overcome. Not only is the reason for doing things given, but successful ways of doing them are described. The student has continually before him the methods used by successful gas men all over the country, and, more than this, the information is organized. This is what counts in the life of the busy employee. The fellow who saves time in getting posted and grounded in the facts of his business has just so much advantage in the race for promotion. Gas companies recommend these educational courses because they know the value of *organized business knowledge*.

Having important information at hand, and getting the advantage of it by absorbing it, are very different matters. It would be a comparatively simple thing to put books and pamphlets into your hands, but experience proves that very few men will follow consistently a given course of study without some assistance. Therefore, the National Commercial Gas Association has taken up the task of helping

(*Continued on page* 346.)

THE AMERICAN GAS LIGHT JOURNAL INC.

Entered at the Post Office, New York City, as Second-Class Matter.

Published weekly at 42 Pine Street, New York City.

Telephone Call, John, 2996. Cable, Am-Gas.

E. P. CALLENDER, President.
A. M. CALLENDER, Vice-President and Treasurer.
CHARLES H. WADELTON, Secretary and Manager.

SANFORD K. CAMPBELL, Editor.

Agents—American News Co., 11 Park Place, New York City.
Lemcke & Buechner, Berlin, Germany.
Aug. Siegle, 30 Lime Street, London, England.

TERMS OF SUBSCRIPTION.

United States, Cuba and Mexico, $3 per year. Canada, $4 per year. All other countries, $5 per year.
Single Copies, 10 Cents.

NOTICE TO ADVERTISERS.

New Advertisements and changes of copy therefor should be in hand Wednesday noon of week prior to date of issue.

NEW YORK, MONDAY, NOVEMBER 30, 1914.

BRIEFLY TOLD.

ANNUAL MEETING, THE NATIONAL CIVIC FEDERATION.—The 15th Annual Meeting of the National Civic Federation will open Friday, December 4th, at Hotel Astor, New York City. The program at the morning session includes the address of President Seth Low, and 15-minute reports from the department chairmen as follows: August Belmont, on provisions for a model Workmen's Compensation law: John Hays Hammond, on an inquiry throughout the country on business stiuation and its effects upon unemployment this winter; Judge Alton B. Parker, of a special committe on the limitation under the Constitution of the rights of free speech and public assembly; Vincent Astor, on a nation-wide inquiry into the effectiveneas of the pure food and drug laws; Miss Maude Wetmore on the work of the Woman's Department; and William R. Willcox, on employer's welfare work. A report on the survey of social and industrial changes of the Industrial Economics Department will be presented by the Director, Roland P. Falkner.

At the afternoon session Professor J. W. Jenks will give a review of present-day tendencies towards the substitution of governmental action for private enterprise. Ex-Governor Stubbs, of Kansas, and Ex-Senator Jonathan Bourne of Oregon, will open discussions on the question: "Shall the Government Own and Operate the Railroads, Telegraph and Telephone Systems and Municipal Utilities?" Ex-Governor Stubbs will take the affirmative and Ex-Senator Bourne the negative side of the question as it relates to railroads; and Congressman David J. Lewis and Dr. Frederic C. Howe will present the affirmative sides relating to telegraph and telephone systems and municipal utilities. The negative side of these subjects will be by speakers yet to be named.

The session on Saturday morning, December 5, will be devoted to the question of social insurance, George W. Perkins, Chairman of the Department, presiding. It will be opened with the report of the commission sent to Europe to study sickness and unemployment insurance and old age pensions. This commission was composed of J. W. Sullivan, representing wage-earners; Arthur Williams, representing employers; and P. Tecumseh Sherman, attorney and social insurance specialist. The domestic phase of social insurance will also be treated, and will include: Fraternal Insurance, by Charles E. Piper of the National Fraternal Congress of America; Trade Union Funds, by George W. Perkins, President of the International Cigar Makers' Union of America; and Railroad and Establishment Relief Departments, by M. W. Alexander, the General Electric Company.

Thereafter a luncheon will be given under the auspices of the Workmen's Compensation Department, at which will be discussed problems arising in connection with the operation of acts now in force in 24 States. Senator George Sutherland, Chairman of the Committee on Uniform State Legislation upon Workmen's Compensation; Louis B. Schram, Chairman Committee on Accident Prevention; Wallace D. Yaple, Chairman Ohio State Industrial Commission; and Cyrus W. Phillips, Chairman Committee on Statistics and Cost of Workmen's Compensation, will be among the speakers.

Saturday's afternoon session will be devoted to the questions of Our Preparedness for War and Our Duties Under the Hague Convention. The speakers will be Dr. David Starr Jordan, Col. Robert M. Thompson, Franklin D. Roosevelt, Assistant Secretary of the Navy Department, Samuel Gompers, and Talcott Williams.

The annual meeting of the Woman's Department will be on Thurskay, Dec. 3, at the Colony Club, 120 Madison avenue, when reports will be made upon the year's work by the officers and the chairmen of sections and committees.

CHARGE FOR EXCESS GAS.—An interesting case was recently before the Public Service Commission, Second District, New York, the complainant being one C. Martin. The complaint had to do with a bill rendered by the Mohawk Gas Company, which the consumer had refused to pay. A pre-payment meter was installed in his residence and for a year or more quarters were regularly dropped into the slot for gas. After the meter had been in use for this time the company rendered a bill for $1.58 for gas consumed over and above that paid for. It developed at the hearing that Mrs. Martin had signed the contract, which fact, it is said, was taken advantage of by Mr. Martin, who said he had known nothing of the contract terms. The superintendent of the gas company explained that prior to 1912 the charge for gas was $1.20 per 1,000 cubic feet. Under the terms of the contract the consumer was to receive 210 cubic feet of gas for each quarter paid, the exact cost of which was more, the difference to be made up subsequently, when the company would render a bill to correct the failure of the pre-payment meter to register correctly; it being impossible, so he said, to mechanically sell 208½ cubic feet of gas for a quarter, the correct quantity for that price. For each quarter deposited in the meter Mr. Martin had received 1½ cubic feet more gas than he paid for, and the bill for $1.58 was for this. The commission reserved decision.

A NATIONAL UTILITIES BUREAU.—The conference of Mayors, called by Mayor Blankenburg, of Philadelphia, and which recently met in that city in a three day's session, unanimously adopted the report of a special committee on recommendations pledging support to a National Utilites Bureau, recently organized and now about to be formally incorporated to fight the battles of the municipalities against utility companies.

The conference did not go on record as favoring municipal ownership of public utilities, State control of the municipal corporations, or Government regulation of private concerns. It contented itself with a concrete indorsement of the National Utilities Bureau plan; and dismissed the subject of public policies regarding control of corporate interests, with the broad declaration that municipalities would have to decide on these various forms of control for themselves, making them consonant with local conditions.

Prominent speakers, in addition to the Mayors attending, were Stiles P. Jones, Secretary Voters' League of Minneapolis; Charles Day, of Philadelphia; John M. Eshleman, of the California Railroad Commission; Ray Palmer, Chicago's Commissioner of Gas and Electricity; Nathaniel T. Guernsey, General Counsel of the American Telephone and Telegraph Company; Delos F. Wilcox, Franchise Expert of New York City; A. Merritt Taylor, Philadelphia's Director of City Transit; Halford Erickson, Wisconsin Railroad Commissioner; Milo R. Maltbie, New York Public Service Commission; and Louis D. Brandeis, of Boston.

Representatives of some of the larger utilities companies complained that the corporations had not been allowed adequate representation on the programme. It was evident that the municipal representatives did not waut to hear the other side of the question. Mayor Harrison, of Chicago, was the most pronounced in favor of municipal ownership and made a violent attack upon the Illinois Commission. Mayor Mitchel, of New York, spoke on the home rule question, and said his city was going to ask the Legislature for a home rule clause as soon as the state body convened. He declared that public ownership of public service corporations was no longer a propaganda to be used against "public-be-damned" policies of corporations, but is to be used in case private management fails to provide adequately for public wants.

SPECIAL ENGLISH CORRESPONDENCE.

MONTHLY LETTER FROM NORTON H. HUMPHRYS, SALISBURY, ENGLAND.

GAS AND ELECTRIC RATES AT LONG EATON AND ILFORD.—AN IMPORTANT PRECEDENT.—ANOTHER LAW CASE.

There is a remarkable difference between the terms on which gas is supplied to the public compared with those applying to electricity. As regards the sale of gas, the Legislation has always taken the view that the consumer should be supplied at the lowest price consistent with paying a fair dividend to the shareholders. In general business it is usual, within certain limits, to sell in the dearest market, and to follow the practice known as giving a sprat to catch a herring. But in the gas industry, even if the consumer is willing, or would be satisfied to pay a higher price, no consideration is allowed beyond the purely financial one of working expenses and the prescribed rates of profit. So long as gas was used for lighting and domestic pur poses only, one even rate all over the district was the rule. But when it began to be applied on a large scale for power and for various technical purposes, the question of discounts for prompt cash payment, for certain rates of consumption, and special circumstances, came into view. And at present, although the bulk is sold at the fixed rate, a system of discounts according to quantity used, starting perhaps from 100,000 cubic feet of gas per quarter, and graduated up to a million or more, is generally used. But the fixed rate is still the leading principle, and the highest allowances would not exceed 20 per cent., while only in exceptional cases would they be more than ten. Taking the annual statement of accounts, the amount written off for discounts and allowances rarely exceeds 5 per cent. of the total sales, and is often much less.

But with electricity the question of cost price, and a fixed rate, gives way to considerations of expediency. Each class of business is exploited to the full, and the good are made to pay for the bad. In theory the fixed rate is kept up, but in practice only a very small part of the consumption is paid for at that rate. There are so many classes of abatements, not a mere matter of 5 to 20 per cent. discount, but anything up to ¾ of the nominal rate. Many companies are selling electricity at the nominal price of 7d. or 8d. per unit, but their annual statements show an average receipt not exceeding 3d., the actual rates charged being anything between 8d. and one penny, or even less. It is also understood that no favored nation clause is allowable. The terms made to one consumer apply to all. If one consumer is supplied with electricity at ¼d. per unit on condition that he uses a minimum of 5,000 units a year, any other consumer of this amount in the district can claim similar terms. Added to this, con siderations of competition have never influenced gas companies or been considered in connection with the tariff. But the electrical undertakings, when they came into existence, found a large portion of the field that they hoped to cover already occupied by gas, and their policy has always been not only to advertise the advantages of electricity, but to injure and create a prejudice against gas. It is a very general practice to offer some advantage in tariff or otherwise on the understanding that gas is not to be used on the premises. By these tactics they hope to reduce consumption and force an increased price for gas, which would go in militation of the well-known fact that electricity is by far the more costly of the two.

At Long Eaton, a manufacturing town in the Nottingham lace district, the greater part of the factories have expensive machinery, and therefore run long shifts, in busy times working all round the clock, and at others perhaps 20 out of the 24 hours. There is a gas undertaking belonging to a private company; and an electric supply that is the property of the District Council. The price of gas is 2/3 or 2/1 for lighting, and 1/10 to 1/4 per 1,000 cubic feet for power, according to quantity used; and electricity is supplied at ¼d per unit for power purposes and 3d for lighting. It should also be observed that the power consumption for electricity is 70 per cent. of the whole. About Michaelmas, 1911, the Electricity Committee announced that the present rate of charges would remain in force where power and lighting were both taken exclusively from the Committee's mains; but if otherwise, the lowest scale of charges would be one penny per unit, and otherwise, according to existing scale. The object was twofold. To benefit themselves by securing a larger proportion of the higher priced business, and at the same time to take business away from the gas company. Many of the mills, while using electricity for power purposes, naturally preferred gas for lighting, in view of the cheap rate at which it is supplied; and the mill lighting at Long Eaton is an exceptionally good line. The gas company considered that the announcement was in contravention of Sections 19 and 20 of the Electric Lighting Act, which provided that every consumer in the district shall be entitled to a supply on the same terms on which any other consumer under similar circumstances is entitled to a supply. And that the undertakers shall not in this matter show any undue preference. In the first place, they suggested arbitration as a means of settlement, but the Distrsct Council maintained their right to make differential charges, and therefore the gas company carried the matter to the High Court of Justice, seeking to restrain an alleged breach of the Section above named. The case was heard in April last, before Justice Sargent. Evidence was produced on either side, but the chief feature was the arguments of counsel, addressed respectively towards proof of a breach of the Act, or toward showing that the announcement was legally in order. At the close of the case, a very full and exhaustive judgement was delivered to the effect that the contention of the gas company was correct, that a breach of both Sections 19 and 20 had been committed, and liberty to apply for an injunction was granted. Against this decision the District Council decided to appeal, and the matter was carried to the Supreme Court of Judicature, where the appeal was heard by a Bench of three Lord Justices a few days ago, with the result that the appeal was unanimously dismissed, without calling on the gas company's counsel for a reply. The proceedings took the form of an argument between the Bench and the appellants' counsel, in which the latter found they had not a leg to stand on. The matter could be brought before the House of Lords, but in view of the decisive failure in the Court of Appeal, the Council can scarcely hope for success. As the point is of widespread interest to gas undertakings, on account of the general character of the hostility above referred to, the Long Eaton Gas Company, and their Manager, Mr. George Stevenson, are to be congratulated on the determination and courage they have shown in forcing the matter to an issue, and establishing a precedent which will go far towards the discouragement of similar practices in the future.

An action of a similar charactor is at present before the Chancery Division of the High Court. The Ilford Gas Company are moviag to restrain the Ilford Urban District Council, from carrying on business in Electric fittings, and from giving preferential treatment to owners or occupiers of houses wholly lighted by electricity, over those partly lighted by gas and partly by electri city. Following the Long Eaton lines, the Council adopted a special tariff, applicable only to parties using electricity exclusively. At Ilford, the electricity supply is the property of the District Council, while the gas at Long Eaton is in the hands of an energetic up-to-date private company who evidently intend to keep their place on the earth, in spite of unfair and oppressive competition. Judgment in this case has not yet been pronounced, and therefore I cannot at present give more than a bare outline of the facts.

An important sidelight was thrown on the position by a discussion which took place at Salford (some 200 miles from Ilford) at a meeting of the Town Council, within the last week or so. The Salford Electricity Committee reported that they had agreed to contribute to the Incorporated Municipal Electrical Association, a sum not exceeding £20 towards the cost which that Association may ultimately be liable to pay in connection with the Ilford action. From this it is evident that the gas companies at Long Eaton and Ilford have to contend, not with the local authorities respectively, but with a powerful Association. At Salford, both the gas and electric supplies belong to the council. Mr. P. Hampson moved that the report be referred back to the Committee, and that the town clerk be instructed to report on the advisability of making such a contribution. In reviewing the facts of the Ilford case, he said that the Ilford council forced a man who used both gas and electricity to pay a higher rate than one who used electricity entirely. The result was that the occupier of a partly lighted large house, though using more electricity than an entirely lighted small house, was forced to pay a higher rate, although the partly lighted house might have a higher

load factor, and cost the undertaking less. If they adopted the resolution, he asked what was to prevent the gas committee asking for a contribution on behalf of the Ilford Gas Company. He submitted that the system of differentiation was arbitrary and unfair, and further, that the Council had no legal right to apply the money of the Salford ratepayers to defend the interests of Ilford. The amendment having been seconded and supported, Mr. Billington explained that the Incorporated Municipal Electrical Association, to which the Committee already subscribed, was formed for the purpose of watching the interests of all municipal undertakings through out the country, and dealt with matters that required consideration, or fighting. And this was a case which, in the opinion of the Association, ought to be taken up. In the future their own undertaking at Salford might be attacked. The amendment was carried.

There seems to be a lack of ordinary business intelligence when a public body owning a gas works, and responsible for making the same a paying concern, subscribes to an association having for one of its objects the legalization of penalizing and hindering the use of gas.

Another interesting case going through the courts is that of Myers *vs.* Bradford Corporation, as owners of the local gas supply. The plaintiff ordered coke from the gas works, to be delivered and tipped over a coal-hole in the pavement in front of his premises. Apparently, the coke was tipped with too much energy, and some of it was shot through a large plate glass window. Action for damages was raised in the local County Court before a judge and a common jury. The jury gave a verdict for £17 2s., the amount of the damage, but the judge held that the defendants were protected by Section 1 of the Public Authorities Protection Act of 1893, and also that the action had not been commenced within six months of the date when the damage was committed. The plaintiff appealed to the Divisional Court, and the case was heard by two justices. These gentlemen could not agree on a verdict, one holding the accident took place during the execution of a public duty and that the corporation were entitled to the protection of the act. The other thought that the defendants, though acting within their statutory powers, had undertaken obligations towards the plaintiff and were not executing a public duty and were not entitled to the protection of the Act. As the court differed in opinion, the appeal was dismissed. The action was then taken to the Conrt of Appeal, where a bench consisting of three lord justices was engaged for three days in deciding whether the corporation were liable for the damages admittedty caused by the negligence of their servants. Counsel for the appellants argued that the protection afforded by the Act of 1893 applied where an obligation was imposed. There was no legal compulsion to sell and deliver coke, but the arrangement was a contract between the parties, and, therefore, the Act did not apply. He contended the defendants had not proved that the circumstances of the case brought them under the special protection and privileges of the Act. They had to show either that there was no negligence, or that it was done in the execution of a public duty. Counsel for the respondents argued that the undertaking was carried on to supply gas and residuals—not for profit, but for the public benefit—and was, therefore, in delivering the coke, acting under a statutory obligation and was protected by the Act. The lord justices, however, held that the courts below were wrong. The general authority to sell and dispose of coke did not carry any special obligation to sell to the plaintiff, or to deliver the order. There was no Act of Parliament to compel them or made it their duty to do so. There was a public duty to sell coke for the benefit of the ratepayers, but no duty at all as between the plaintiff and corporation. The Protection Act did not apply, and the appeal would be allowed. Counsel for the corporation, on hearing the judgment, announced that the case would be taken to the House of Lords.

Whatever the legal aspect of the question may be—and the conflicting opinions recorded leave the matter in a position that illustrates the glorious uncertainty of the law, but does not help to any useful conclusion—the opinions of the man in the street are decidedly in favor of the plaintiff. The defendents are a powerful and wealthy corporation, to whom the amount claimed would be an insignificant consideration. They damaged the plaintiff's property, admittedly by an act of carelessness on the part of their employees, and there is no reason why he should be left to bear the cost of repair. The expenses already incurred in obtaining the contradictory verdicts, are far in excess of the actual claim, and it does not appear that they will lead to the establishment of a definite precedent.

(*Continued from page* 343.)

the gas men of the country in this important matter of guiding and directing the reading, study and application of the best principles and practice in the gas business. What the student pays for the course hardly covers the cost of preparing the printed matter. The correcting of his written answers to the problems comes to the student as an added service. More than this, the student has available the personal advice of the Director of the course, the Board of Educational Control, and the body of experts under whose supervision and by whose hand the lessons have been prepared, criticised, and discussed. This work has taken months of time on the part of these men, but they have given it freely because the companies know the need of more and better preparation on the part of their employees. The need is imperative and pressing, for no gas company can make progress without the aid of the highest intelligence of its men. The other interested party in this movement is the employee. He cannot expect to go on with so little preparation for his work. He must know the gas business, and may lose his job if he does not. This is his opportunity. The unusual advantages that the N. C. G. A. offers make it possible for you to qualify for a better situation and higher salary.

Heretofore, salesmanship has been the dominant feature of our educational activities, but 3 years of experience has shown that there is a demand for instruction in other fields of commercial gas enterprise. Accordingly the Board of Educational Control has extended the work to include office men and those in other departments; accounting, office procedure and commercial management are now included in the course. Moreover, there is a growing demand for more intensive study of certain fields of salesmanship. Therefore, the Board has prepared lectures especially for industrial fuel and power specialties, specialists in illumination, the general salesmen, commercial managers and accountants. The gas salesman can specialize in a chosen field and become expert in it, while the accountant and the commercial manager have opportunities never before offered in the gas business.

The new educational course combines theory and practice. The principles will be stated and illustrated in a set of text-books, issued separately from the questions and problems, which can be kept as reference books, and thus serve the reader continually when practical problems arise needing knowledge of mathematics, chemistry or physics, to effect a solution. The text books furnished with the course are printed in large, clear type, on the best paper, and adequately illustrated, and are much superior to those sent out by correspondence schools at three times the cost. Moreover, there is no padding, because they are prepared especially for gas men. No useless technical matter is included, and the books are readily understood.

The problems and questions, which are mailed each month, deal only with the practical side of the subjects. The problems are prepared, as far as possible, from experiences met in the selling field, in the office, and in the daily activities of the commercial manager. The student is permitted to send in answers to the questions and problems, which are examined, criticised, and graded, and then returned to him, that he may know exactly what progress he is making. At the completion of a course the student receives a diploma, indicating the special field covered, and signed by the President and Secretary of the N. C. G. A., by the Director of the course, and the Chairman of the Board of Educational Control. In a practical way this diploma should mean much to any gas company employee who is ambitious to succeed, for it will be strong evidence of merit.

A year is too short to lay the necessary basis of a legal or medical career; a college degrees with 3 years more of special training is compulsory. Why should a business man expect to get along with a 6 months' course in a night school? The N. C. C. A. has taken many factors into consideration and has finally decided that 3 years of study, with the every-day work of the gas employee, is necessary to thoroughly equip any man who expects to succeed in this line of business. One hour a day devoted to thinking about his work is not too much to expect of a man. The taking of this course means that a man decides that he will think about his work as he goes along every day 3 years. If questions arise which he cannot answer he promises to find out before he quits. The course as outlined makes it possible for every serious minded man to do this, and experience shows that about 3 years of organized thinking along with the every-day work will fit a man to become expert, instead of just able to hold his job.

For a man to really understand the gas business, there must be some understanding on his part of certain principles of correspon-

dence, mathematics, chemistry and physics. The course gives only those things which are of practical importance to the gas employee, whether he be a specialist in the selling of gas for industrial fuel, or power, for domestic or illumination purposes, whether he be an accountant, order clerk, or commercial manager.

FIRST YEAR.—(Same for all Courses).

1 *Business English*.—The Use of Words. Principles of Language. Common Errors of Speech. How to Acquire Accuracy, Force and Fluency. Business Forms and Correspondence.

2. *Mathematics*.—Arithmetic: Addition, with Short Cuts. Subtraction. Multiplication, with Short Cuts. Division. Fractions, with Short Cuts. Decimals. Square Root and Cube Root.

Mensuration: Measurement of Length, Areas, Volume, Angles, Solid Angles.

Geometry: Lines. Angles. Surfaces. Solids.

Algebra: Meaning and Use of Algebraic Symbols. Addition and Subtraction. Positive and Negative Quantities. Multiplication and Division. Fractions. Formulas, and the Formation and Solution of Equations. Practical Applications.

3. *Physics (Elementary)*.—Fundamentel Ideas: Force. Weight. Velocity. Energy.

Mechanics: Levers. Gears. Pulleys. Screws. Fluid Pressure. Specific Gravity.

Sound: Nature. Production. Transmission.

Heat: Nature. Conduction. Convection. Radiation. Expan sion and Contraction.

Light: Nature. Production. Transmission. Absorption. Reflection. Diffusion. Spectrum. The Eye: Structure, Functions, Effects of Light.

Electricity and Magnetism: Magnets. Electrical Charges. Electric Currents: Nature, Effects. Batteries. Motors and Dynamos. Lamps. Telephone, Telegraph and Wireless.

4. *Chemistry (Elementary)*.—Nature of Chemical Action. Laws of Chemical Action. Elements and Compounds. Reactions: In Manufacture of Gas, in Purification of Gas. Chemistry of Flame. Coal Tar Products.

FIRST HALF OF SECOND YEAR. (Same for all Courses).

5. *Manufacture and Distribution of Gas*.—Coal Gas. Water Gas. Carburetting. The Gas Plant. Gas Holder. Mains. Governors. Services. Meters. Housepiping.

6. *Generation and Distribution of Electricity*.—Boilers. Engines. Dynamos. The Power House. Switchboard. Transformers. Transmission Lines. Services. Meters. Housewiring.

The course just described must be taken by all students, and covers the first one and one-half year's work. The courses following cover the last year and a half. It is desired that students designate the course they wish to take at the time they enroll, but they may defer making the selection until the completion of the first year's work. Students must select one of the following courses:

COURSE I.—*For Industrial Fuel and Power Specialists.*

This course covers the field of selling gas for fuel and power on a large scale. The work, for the first year and a half, has been outlined above and is the same as for all the courses.

For last half of second year and the third year:

2. *Industrial Fuel and Power Engineering*.—Selection of Fuels. Blast Burners. Compressed Air. Design of Burners. Application of Burners. Design of Appliances. Applications: Metal Working, Hardening and Tempering, Casting, Welding, Metal Melting. Woodworking Trades. Cloak and Suit Trades. Hat Manufacture, and other trades. Gas Fired Steam Boiler: Design and Application. The Electric Furnace: Principles and Applications. Electric Welding. Power: The Gas Engine, Principles and Operation, Application. Motor Drive: Applications in Various Industries. Producer Gas. Fuel: Coke and Charcoal, etc.

8. *Salesmanship*.—Practical Selling.

COURSE II—*For Specialists in Illumination.*

The work of the first year puts the student in touch with the essentials of the gas business as a whole, and grounds him in the principles of mathematics, physics, chemistry, and correspondence. The second year's work leads the lighting specialist into the essentials of the gas business on its technical side. He learns the principal things connected with the manufacture and distribution of gas, and as a salesman he must be familiar with the nature of the chief competitor of gas, hence the essentials of the generation and distribution of electricity are presented to him. In the third year of this course he is advanced toward that degree of proficiency which should make him an expert in the lighting field. Accordingly, he is given a course in illuminating engineering, and, with it, one on practical selling. Thus he joins together the technical and commercial sides of his profession.

9. *Illuminating Engineering*.—Illuminants and their Characteristics: Gas. Oil. Electric. Gasolene. Miscellaneous. Illumination: Requirements, Intensity, Distribution, Ease of Vision. Calculation and Data. Comparison of Systems. Design of Lighting Systems, Fixtures, etc. Aesthetic Considerations. Examples of Representative Installations: Stores, Churches, Theatres, Offices, Residences, Factories. Street Lighting. Measurements.

8. *Salesmanship*.—Practical Selling.

COURSE III.—*For General Salesman.*

The domestic appliance salesman must have a general knowledge of the gas business as a whole. If the seller of gas for heat and power is called a specialist, the domestic appliance salesman in contrast should be called a general salesman. For him, therefore, the course provides fundamental training in English, mathematics, physics and chemistry, and information of a general nature appliable to the problems of selling gas for lighting, cooking and other domestic purposes. In the second half of the year he began to specialize on the utilization of gas and electricity, and is now prepared to meet many of the problems which depend upon a knowledge of the principles laid down in the first year and a half's work. The work of the last half of the second year and the third year is an advanced course on the utililization of gas and electricity. Combined with this is a course on practical selling.

10. *Utilization of Gas and Electricity, and Competitive Fuels Illuminants*.—Cooking: Domestic, Hotels, Restaurants and Institutions. Water-heating: Meeting the requirements for Different Classes of Service. Heating: Systems, Appliances, Calculation. Lighting: Lamps, Illumination, Requirements, Calculation. Industrial Power and Fuel: General Requirements.

8. *Salesmanship*.—Practical Selling.

COURSE IV.—*For Commercial Managers.*

In all the educational work done by the N. C. G. A., a large proportion of the the students have been men in positions of administrative or executive responsibility. The records also show that many of the students enrolled have definitely planned to advance themselves into positions of managerial responsibility. It was, therefore, thought advisable to offer a course for men with these ambitions, and the following subjects running over 3 years have been prepared. That this course is somewhat more extended than the others will not surprise those who know of the necessity for a thorough training for the position of commercial manager. To cover the expenses connected with the extra work, an additional fee of $5 is charged when this course is paid for in advance; $6 or $2 per year, when paid yearly in advance; $7.20 or 20 cents additional per month when payments are made monthly. However, those who have been following Part III. of the 1913-1914 course, need study only selected portions of the Utilization of Gas Appliances.

The big problem of the commercial manager of to-day is not the hiring and managing of salesmen, or the control of an office force. but the co-ordinating of the commercial activities of the gas company as a business enterprise, with the ideas of the public who are demanding more and better service every day. The question of public utilities is one of the great questions of the day. The gas companies are among the first to feel the pressure of public opinion. The commercial manager must stand, therefore, between the public and the company. He must be able to meet the demands of the public and yet show profits for the company. The third year of this work covers many points upon which the commercial manager should be thoroughly posted.

10. *Utilization of Gas and Electricity*.—Lighting. Heating. Cooking.

Illumination: Illuminating Engineering. Industrial Fuel and Power Engineering.

11. Sales Promotion.

12. *Public Utilities*.—Organization. Operation. Interdepartment Relations. Public Relations.

COURSE V.—*For Accountants.*

Every convention of gas men develops a discussion about the efficiency of the men in the company's offices. It is generally acknowledged that the weakness found here is a lack of specific in formation about the gas business. The general course, which covers the first year and a half, is designed to furnish the student this knowledge. The last half of the second year and all of the third year is given up to accounting subjects. The two main branches of the business of an accountant will be dealt with:

1. His work as an accountant.
2. His work as an auditor.

The first includes the various methods of bookkeeping in all its branches, from the keeping a petty cash book in a small office, to the accounts of a large holding company.

The work of the student will be largely creative; he being required to devise methods of accounting for given conditions, and to plan for the proper carrying out of his system. He will be given financial statements to analyze with the idea of testing his ability to detect the weak spots. Trial balance, profit and loss account, balance sheet, reserve funds, sinking funds, depreciation, income tax, classification of accounts, etc., etc., together with curves and diagrams and their application will be considered.

Under the second head will be included the duties and responsibilities of an auditor, together with the reasons for such examination of accounts. Details will be given of good practice in auditing, and the student will be called upon to pass upon work in a critical way.

It will be desirable for accounting students to take the Public Utilities Course (No. 12) outlined for Commercial Managers.

The Secretary of the National Commercial Gas Association will furnish details as to cost of the courses, etc.

Semi-Indirect Lighting with Gas.

[Paper read by MR. J. P. HANLAN at Meeting of the New Jersey State Gas Association.]

One of the latest developments in modern gas lighting is that made possible through the use of semi-indirect lighting fixtures equipped with the new horizontal burners, a few specimens of which are on display here to-day, through the courtesy of Messrs. Conroy, Barnes and Johnson. Semi indirect lighting is not new. I am informed by Mr. Barnes that this form of lighting was first introduced in 1889 in fixtures constructed for kerosene oil lamps. Many such fixtures were sold, and, no doubt, most of us recollect the satisfaction they gave. Their operation was simple, the dish being suspended by chains running through pulleys, which made it an easy matter to raise and lower the lamp for filling and cleaning.

The application of gas for semi-indirect lighting was considered in 1897, and the idea of feeding the gas through a centre stem was conceived, at first upright lamps being used, superseded later by the inverted lamp. This construction was satisfactory so far as the illumination was concerned, but the discoloration of fixture and ceiling was such that manufacturers began research work to develop a burner which did not require a stack and glassware. As the result of their efforts the horizontal burner was designed, and gradually brought to its present state of efficiency. This burner has made possible the construction of the type of fixtures shown here, which are on a par with any semi-indirect fixtures, and also those for use on brackets, standing columns, and for cove lighting. Some of you will recall seeing semi-indirect fixtures of this character at the N.C.G.A. meetings in Taft Hall at Atlanta, and at Horticultural Hall in Philadelphia.

From the foregoing it will be seen that semi-indirect lighting fixtures are now available in a large variety of styles suitable for residences, stores, offices, churches, theatres, schools, etc. This being so, it remains for the gas companies to energetically take up the sale of semi-indirect fixtures, as their use affords us invincible arguments, such as the hygiene of gas lighting and care of the eyes, on which we can dwell more forcibly when advocating the use of semi-indirect lighting than was possible with former lighting fixtures, since the source of light is obscured and we have splendid diffusion without glare. Then, too, we have decorative effects with semi-indirect fixtures which surpass those obtainable with other gas fixtures. We also have reason to expect less trouble in maintenance, thereby giving greater satisfaction to users, as we have but one burner to consider in most installations, and one pieee of glassware. Our experience with the horizontal burner is such as to lead us to believe that it will satisfactorily operate under a wide variety of conditions. Again, our experience is that discoloration of the upper part of fixture and ceiling will be materially reduced with this fixture, in conjunction with horizontal burners.

One installation which has been in use over 5 months has been closely watched by the writer. and although some products of combustion are deposited on the fixture arms, it can be readily wiped off and no appreciable tarnishing results, For a distance of approximately 9 inches from outlet in ceiling, slight discoloration can be seen by looking closely at the centre piece, but it is so little that it can only be detected by close scrutiny. Some of this discoloration should be charged against a gas dome which the semi-indirect fixture displaced. One strange feature in connection with this discoloration is that the ceiling canopy is as bright as the day the fixture was installed. Again, the house faces a street on which cars and other traffic pass, all making dust, some of which, no doubt, enters through open windows and is conveyed to the ceiling by circulation of air when fixture is in use.

With semi-indirect fixtures equipped with horizontal burners, we get a much higher candle power per cubic foot of gas consumed than with other types of burners, and having so many other advantages, the possibilities for its useful application in gas lighting seems limitless; and the writer believes that the question resolves itself to this:

Will gas men make the most of their opportunities now—while semi-indirect lighting is in vogue?

Here are some facts we have learned by experience, and what others tell us about semi-indirect lighting with gas:

That semi-indirect lighting, although having a wide range of usefulness, is not to be recommended without first considering the needs of the consumers. For instance, for a storekeeper who wishes plenty of light for little money, the inverted gas arc would, in all probability, be the unit to recommend; or it might be that his requirements are such as to make the large inverted single mantle lamp the medium to recommend. Gas semi indirect lighting is not adapted for places having low ceilings, 8 feet 6 inches being the minimum heighth of ceiling for which we should recommend it, as we should have 2 feet 6 inches over-all length of fixture. A prominent illuminating engineer says that semi-indirect lighting is not the best method of lighting rooms having beamed ceilings. Care should be exercised in the selection of glass dishes used in semi-indirect lighting. We have found the best plan is to buy the fixture complete from the manufacturers, and not purchase the bowls or dishes separately, as some will not stand the heat from the open mantles. A manufacturer who has made some experiments told the writer that the glass bowl should be half the depth of its diameter—a bowl 16 inches wide should be 8 inches deep. Our experience leads us to confirm this, and we avoid the use of shallow dishes. We have also found that dishes, generally speaking, should be equipped with 3 mantles, as 2 do not give enough light to satisfy most people. Of course, for dens, halls and bedrooms with light ceilings, 2 mantles in a 14-inch bowl will give excellent results. Fixtures for churches, halls, etc., in which the bowls are unusually large, should have more than one horizontal burner; in fact, it may be necessary to use 3 or 4 burners to get proper diffusion of light.

Semi-indirect lighting with gas is preferable to indirect lighting, as the former, when of proper design and rightly installed, possesses every advantage of indirect fixtures, and most people prefer to see the source of light, when its brightness is reduced by the bowl. Of course, best results are secured when ceilings and walls are painted or papered in light colors, as about one-half the illumination obtained is from light reflected from them.

THE Bureau of Standards' Technologic Paper No. 41 deals with "The Lead Acetate Test for Hydrogen Sulphide in Gas," The effect of the following factors upon the lead acetate test have been investigated: (1) The paper: Kind; method of its preparation, including the strength of lead acetate solution used; and the moisture content when used. (2) The gas: Its humidity, and the period and rate of flow. (3) The apparatus: Its form and size, as determining the circulation of gas with respect to the paper. The conclusions reached in regard to the effect of these various fectors are given in full. A simple apparatus for carrying out the test is discribed, and specifications suggested for carrying out the test in a way that will be of quantitative significance. Copies of the paper may be had upon application to the Bureau of Standards.

High Pressure Gas Lighting at the Panama-Pacific International Exposition.

By A. A. Willoughby.

The street lighting with high pressure gas lamps which has been installed in the State and Foreign Building section of the Panama-Pacific International Exposition, is the first of its kind on a commercial scale in the United States. There have been some installations for demonstrative purposes, but the scheme followed out by Mr. Guy L. Bayley, Chief of the Department of Mechanical and Electrical Engineering of the Exposition, is unique and worthy of note.

The State and Foreign Building section occupies nearly a third of the Exposition site, which comprises 635 acres, and is situated in the western part of the grounds. The main artery for traffic is the Avenue of Nations, running from the southeast corner of the section diagonally in a northwesterly direction to the waterfront. This, with the other streets and avenues in the section, is lighted by Welsbach high pressure 2-mantle gas lamps, mounted singly on the top of ornamental staff-work columns; gas lighting is used exclusively for these streets. The 18 foot high columns are on both sides of the streets and avenues, spaced to suit the conditions. There is also a line of these lamps along the top of the parapet wall built along the waterfront, from the California Building west to the Live stock section. There are 225 of these high pressure gas lamps in the installation. The gas used is oil gas, with a heat value of 600 B.T.U., made from crude California petroleum in the Metropolitan Station of the Pacific Gas and Electric Company, a little over a mile distant from the Exposition. It is piped direct to the distributing system on the Exposition grounds, carried in the mains at 30 pounds. By means of a regulator in the base of each column, the pressure is reduced to 3 pounds, at which the lamps are operated. From the main distrib uting system feeders of lap welded steel pipe 4 inches and 6 inches in diameter, are run to the important buildings. The feature of the installations of all the public utilities on the Exposition grounds, is that they are fully equal to those in municipalities, which have taken years to acquire and are intended for continued use, whereas the Exposition utilities are to be used for but a comparatively short time. The aim of the designers of the illumination of the Exposition has been to produce a light which, while thoroughly effective, will be restful to the eye. This has been followed out in the globes used on the high pressure gas lamps. The globe is of dense white glass, 18 inches in diameter, and forms a secondary source of illumination, the mantle not being visible. The resulting brilliancy being low, it is not tiresome to look at the lamps, yet the illumination secured is amply sufficient. Each lamp consumes 21 cubic feet of gas per hour, and gives a mean spherical candle power of 408 candles.

Installations of these same lamps have been made at all the en trances and exits on the grounds and over the change-makers' booths, giving an unfailing supply of light at all times. The approaches are also well lighted. The gas lamps at the entrances and exits of the main group of exhibit palaces, and the entrances to the courts, are of low-pressure type, mounted on brackets.

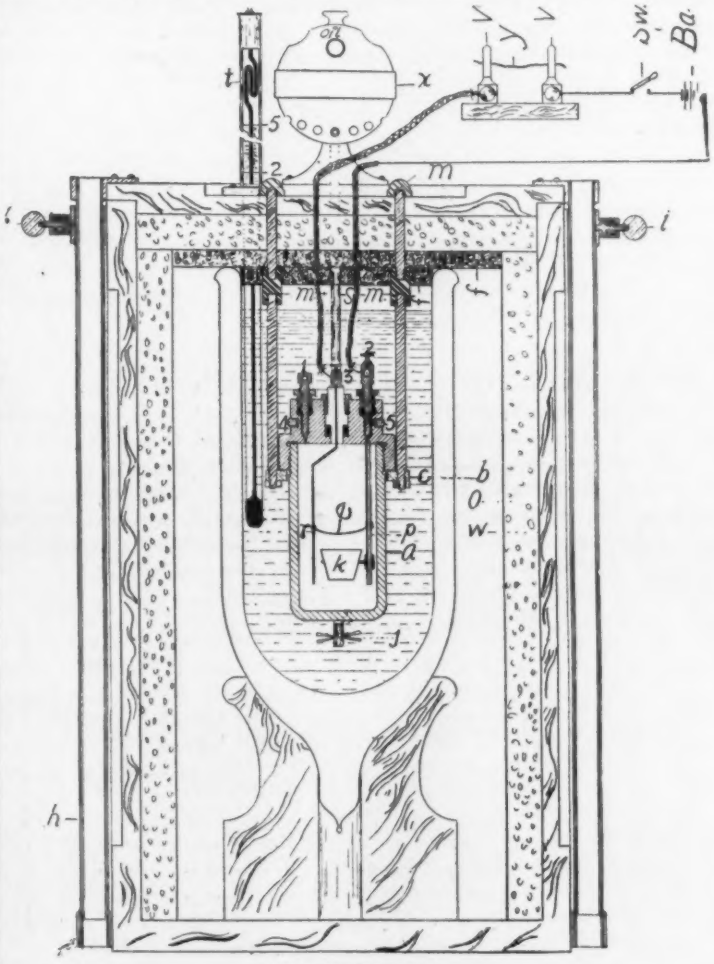
In the exhibit section there are fifty kiosks about the perimeter of the main group of palaces, and a high-pressure gas lamp has been placed on the top of each kiosk. In the event of failure of the elec tric lighting system at any time, it will be possible to leave the grounds in perfect safety, the auxiliary illumination furnished by the gas lamps giving sufficient light. The carefulness with which every contingency that could arise in the handling of the crowds has been provided for is unique in exposition annals. Public safety has been the goal of the illuminating engineers, besides trying to produce new and novel lighting effects. The idea of an auxiliary lighting system which will serve in case of failure of the electric lighting has not been so carefully carried out in previous expositions, and the Panama Pacific has set a mark in this respect.

In the concessions district outline lighting with incandescent lights is largely used on the fronts of the buildings, and gas lighting has been added by the Exposition along the Zone, the main avenue of the district, to add a touch of color to the scene and relieve the "great white way" effect. Gas standards 35 feet high are placed at intervals of 100 feet on both sides of the Zone. There are 72 of these standards. At a height of 15 feet, brackets of staff-work extend on two sides from the pole, and from each bracket are suspended two Humphrey 5 mantle gas lamps. Large lanterns of decorated canvas are hung about the lamps, and with the sculptured design of the bracket and the top decorations of the pole, give a striking Oriental appearance. The poles are also used for carrying bunting, and for streamers of colored incandescent lights which will be strung in all directions and draped in graceful festoons. The usual amusement park depends on a garish blaze of light, blinding to the eye and tiresome after a time. The innovations introduced in the lighting of the Zone will be welcomed by its patrons.

While high-pressure gas lamps have been extensively used in several European cities, the installation in the exposition grounds shows many improvements over foreign practice. This form of street lighting is the finest to be found anywhere, and will doubtless be widely copied.

Adiabatic Calorimeter.

Calorimeters in general are subject to errors by radiation through the surrounding wall, of conduction through the metallic parts and the thermometer, and the inaccuracy of the thermometer readings. The Riche adiabatic calorimeter is an attempt to eliminate these errors, through the use of a *vacuum cup* with a suitable covering and



Adiabatic Calorimeter.

insulating parts. The figure is a section of the bomb and calorimeter. It consists of a bomb, *a*, of any type; vacuum cup, *b*, containing water, a stirrer, *j*, and a thermometer, *t*. The vacuum cup is of standard size, 14 cm. wide, 30 cm. high, inside measurements.

The bomb shown is a Mahler-Kroeker porcelain type, good for 8,000 combustions. The support for the bomb is a hinged ring, c, supported by two brass rods connected with the cover. The rods are insulated by passing them through hard rubber, *m*, and a hard rubber cap is screwed on the end of each rod.

To prevent heat loss from the vacuum cup, it is surrounded by an oak box, *w*, lined with 1-inch pressed cork, *o*, glued to the wood. On the cover, in addition to the cork, is glued a piece of hair felt, *f*, ¼-inch thick, making a tight joint on top of the vacuum cup.

A hinged door in the front facilitates the handling of th e vacuum cup, and the cover is raised and lowered by means of telescope tubes, giving opportunity to place the bomb in the split ring and to adjust the ignition wires. After the cover is lowered the thermometer is inserted throug a hole in the cover.

The substance to be burned is prepared, weighed and put in the bomb, which, after charging with 30 to 40 atmospheres of oxygen, is

placed in the split ring, and the wires connected. The water in the vacuum cup is brought to a temperature within plus or minus 5° of the room, the cup is placed in position, the door closed and the top lowered. The thermometer is then adjusted and the stirrer started. Readings are then taken until the temperature of the water shows constant for three successive minutes.

Temperature equilibrium having been established, the bomb is removed, opened and rinsed with water, and the rinsings are titrated with one tenth normal alkali for nitric acid, using litmus as an indicator.

Ignition of the substance in the bomb is accomplished by a current from three 2-volt storage cells, which first passes through a 3-ampere fuse wire in series with a platinum wire inside the bomb. The platinum wire is connected to the substance to be burned by a linen thread of sufficient size to secure ignition. The fuse assures constancy of ignition heat.

While other types of calorimeter frequently require repeated readings, and a complicated system of calculations because of imperfect insulation, the Riche calorimeter needs only minute readings. It requires from 3 to 5 minutes for the temperature of the water to become stationary. The operator may ignite his material, and then do anything that he pleases during the short interval that follows the final reading.

The reading at ignition is taken as the initial reading, and sub tracted from the final reading gives the total rise. The rise multiplied by the weight of water (plus the hydrothermal equivalent of the apparatus) gives the total number of calories liberated. From this is taken the heat resulting from the ignition, and the nitric acid formed. This result, divided by the weight of substance, gives the calories for the unit of material oxidized.

The Riche calorimeter saves from 50 to 75 per cent. of the operator's time, and is a perfect calorimeter device.

New Methods and Appliances.

TESTS OF FLANGED FITTINGS.—The following tests of the comparative strength of various shaped flanged fittings are interesting to engineers, says *Valve World*. It may not occur to many that the shape of a fitting, to a great extent, determines its bursting strength. To demonstrate this point a selection was made of the following fittings, all of a size, and subjected to hydraulic pressure to destruction. Fittings were of uniform metal thickness throughout and the fractures showed clear metal without porous spots or sand holes:

Fitting.	Bursting Pressure Lb.
Long-turn ell	2,800
45 degrees ell	2,600
Reducing ell (large opening size of straight ell	2,600
Straight ell	2,400
Reducing tee (large openings size of straight tee)	1,700
Reducing cross	1,600
Four way tee	1,600
Straight tee	1,500
Reducing lateral	1,500
Straight cross	1,400
Straight lateral	800

From these figures it will be seen that the strength of ells is practically the same regardless of degree, or whether straight or reducing; that fittings of the general shape of the tee or cross are of nearly the same strength, and have relatively about two-thirds the strength of fittings of the ell shape; that the straight lateral is weak, having only about one-third the strength of the ell.

Recent Patent Issues.

Prepared for the AMERICAN GAS LIGHT JOURNAL by ROYAL E. BURNHAM, solicitor of patents and counselor in patent causes, 833 Bond Building, Washington, D. C., from whom illustrations and specifications of any patent mentioned below may be obtained for 20 cents.

1,117,172. Apparatus for Increasing the Temperature of Combustion in Gas-fired Furnaces. H. L. Doherty, New York, N. Y.

1,117,309. Gas-Washer. H. Bentz, Montclair, N. J.

1,117,521. Guard for Inverted Incandescent Mantles. H. Rosenthal, Berlin, Germany, assignor to J. P. Aktiengesellschaft, same place.

1,117,538. Rectangular Container for Incandescent Mantles. W. T. Wilson, Philadelphia, Pa.

Items of Interest
FROM VARIOUS LOCALITIES.

JAMES W. DUNBAR, who has been manager of the gas department of the United Gas and Electric Company, New Albany, Ind., has assumed the duties as assistant to President Chester P. Wilson, of the Middle West Utilities Company, in Indiana. He will have charge of the United Gas and Electric properties in New Albany, and also of the New Albany water works.

A GENEVA (O.) councilman, while the council was attempting to formulate measures regulating the quality of the city gas supply, objected when it was proposed that the British thermal unit system be used. He jumped to his feet and said: "Gentlemen, that would be in violation of President Wilson's orders for strict neutrality, and I'm against it." The matter was held over until the next meeting.

LUNCHEON in the gas plant of the Central Illinois Light Company was an innovation which attracted 125 members of the Rotary Club of Peoria, Ill., one day last week. The members took luncheon in boxes and dined in one of the buildings at the works. Afterwards they were conducted in squads of 15 through the various departments of the plant and shown details of the manufacture of gas. General Manager Wallace, Superintendent Bushnell and their assistants were the escorts.

MILFORD, Mass., is to get a reduction in gas street-lighting rates. The Globe Gas Light Company announces that, beginning November 1st, the rate per lamp will be $28 per year, instead of $30, as heretofore,

---

THE city council of LeMars, Iowa, has passed a resolution ratifying the franchises for the LeMars Gas Company and the LeMars Water and Light Company, which were voted upon by the citizens of LeMars at the general election Tuesday, November 3.

THE Brenham (Texas) Gas Company has received and unloaded a carload of pipe, which will be used as a trunk line into the Blinn College neighborhood in the southwestern part of Brenham. The pipe has already been strung along the route and the ditching will begin at once. Manager J. J. Campbell reports more pipe ordered and on the way.

MR. JAMES B. LANCASTER, Superintendent and Manager of the Wilmington Gas Light Company, in New Castle, Del., is a candidate for the vacancy in the Board of Trustees of the Common, to succeed James B. Toman, whose death followed, being struck by a railroad train. The term is for life or until a resignation is received.

THE Chattanooga (Tenn.) Gas and Coal Products Company has opened bids for the concrete parts of its coke oven plant in Alton Park, but the name of the successful bidder was not announced. All bidders were understood to be Chattanoogans. The brick work for the coke ovens will be the most important job to be let in connection with the plant, and is next to be considered by the engineers. President Wolle arrived from New York a few days ago and joined his family on Signal Mountain.

THESE officers were elected at the annual meeting of the stockholders of the Sussex (Del.) Gas Company: Directors, E. R. Bell of Haddonfield, N. J., H. M. Tracey and M. H. Harrington of Philadelphia, Edward J. Winder of Seaford, C. A. Hastings of Laurel. The directors organized by electing E. R. Bell, President, and H. M. Tracey, Treasurer. A considerable increase in business for the past year was shown by the annual report.

THE local newspaper says the handsome new office and display rooms of the Savannah (Ga.) Gas Co., is open to the public and a mammoth display of improved heating and lighting appliances is being shown. Upon entering the office the visitor is at once attracted by the display in two handsome windows on either side, finished in oak, and with lighting of the most approved and up to date design, controlled from the inside by a push button, a system of window lighting distinctly new in the South. The fixtures for lighting the main office are of the semi-indirect type, which also is new in this section. The display of cooking and heating appliances on the first

floor is very complete. The complaint desk, in charge of an experienced employee, is in the rear. Telephone connections with all departments from the outside are available. The cashier's counter is directly opposite the complaint desk, and the offices of the chief clerk and the vice-president are farthest in the rear. Patrons of the company will always be welcome there. On the second floor is the bookkeeping and accounting department, connected by a "carrier" system by which bills, etc., are being brought from the department above to the order desk on the first floor. The entire building is heated with the gas-steam radiator. The top floor will be used for demonstration purposes, and the company will appeal for the co-operation of the housewives to the end of having their cooks attend demonstrations several times a month. Such work, in connection with the domestic science courses now being taught in the Cuyler Street School, which was recently equipped with cooking appliances by the gas company is expected to result in much benefit to the householders in this city.

HAVERHILL (Mass.) Gas Light Company employees are keen on bowling, and are pulling off a 4-team tournament. The last match resulted as follows:

Team One.

Bowler.	1	2	3	Total.
Barry	79	80	82	241
Milne	78	81	82	241
Kidder	80	93	89	262
Rowe	98	92	88	278
Havener	87	97	89	273
Totals	422	443	430	1295

Team Two.

Bowler.	1	2	3	Total.
Wrenn	81	87	72	240
Kirk	83	68	75	226
Leith	66	85	89	240
Wason	64	69	88	221
Cate	108	79	96	283
Totals	402	388	420	1210

The ranking of the teams is thus:

	Won.	Lost.	PF.
Team One	4	0	1295
Team Three	4	0	1268
Team Four	0	4	1213
Team Two	0	4	1210

A COMPLAINT has been filed in an action by John Gaffney against the Central Hudson (N. Y.) Gas and Electric Company, for the recovery of $1,000 for the alleged trespass upon and unlawful entry into the property of the plaintiff, and the alleged wrongful disconnecting of a gas meter on the promises. The complaint alleges that Mr. Gaffney had on the premises a prepayment meter, and that because he owed the company, the agents of the company entered his land and house and took the meter out; as a result of which action he was without gas for two weeks.

PRACTICALLY every business house in Greeley, Col., closed during the funeral of Mr. D. A. Camfield, builder of some of the finest buildings in Greeley, owner of the Home Gas and Electric Company, large stock holder in the street railway company, the "Tribune-Republican newspaper, the City National Bank and other prominent business concerns of Greeley. He was a pioneer, of the city and one of its foremost citizens. His death occurred from apoplexy while in New York, endeavoring to finance one of his numerous irrigation projects.

AT a meeting of the Framingham, Mass., Board of Trade, Supt. Jennings of the West Boston Gas Company, whose works are located in Framingham said that about one-half of their output went to the Marlboro and Hudson Company, and about one fifth to the Natick Company. Plans are working out well and already they are able to make a reduction in the price of gas for Framingham to $1.40, and doubtless there will be more reductions in the future as the volume of production and consumption increases.

MR. A. B. MACBETH has been elected Vice-President and General Manager of the Southern California Gas Company, taking the place of A. C. Balch, resigned. Mr. Balch will remain active in the gas and power field, however, continuing as a director of the gas company, and retaining his connection with the San Joaquin Light and Power Company. His retirement was at his own request, as he desired to relinquish the heavy responsibilities of active management. Mr. W. G. Kerckhoff remains as President of the company. Mr. Macbeth is declared to be well fitted for his new position, as he is not only a practical gas man, but has had years of experience in handling the financial problems of such a concern.

IN order to get the best possible terms for lighting, William Williams, Commissioner of Water Supply, Gas and Electricity, of New York, announced that in the future the city will not accept gratuitous lighting from any corporation. It has been the custom for the various lighting companies to contribute, free of cost, current for decorative lighting, for parades, celebrations and carnivals. In a letter to the New York Edison Company, outlining his intention to put the purchase of light on a business basis, he said: "I do not think it right that public utility corporations with which the city has business relations should be required, or even allowed, to donate anything to the city. I am opposed to the practice of city officials making requests for free light and shall do whatever in my power lies to prevent their being made. It is much better for all concerned that the relations between the city and the public utility corporations be conducted strictly on a business basis. In past years free light has been furnished by lighting companies for the Fourth of July and Christmas lighting in the parks. In the future I will not allow the city to accept these favors."

THE Pacific Power and Light Company supplies Lewiston, Idaho, with gas on the following rates: First 5,000 cubic feet, $2.10 per 1,000; next 5,000 cubic feet, $1.35 per 1,000; next 10,000 cubic feet, 70 cents per 1,000, all less a discount of 10 per cent. if paid within 10 days from date of bill. Complaint has been filed against the reasonableness of the rates before the Public Service Commission.

A BILL has been filed in the Circuit Court, at Towson, Md., by the Ten Hills Corporation, against the Consolidated Gas, Electric Light and Power Company, asking an injunction to restrain the gas company from connecting with certain mains on the property of the Ten Hills Corporation. An agreement was entered into by which the land company gave the right to the gas company to lay mains on the property at the expense of the land company, for the purpose of serving the property at Ten Hills; but now the gas company has declared its intention of connecting with the mains for the purpose of supplying customers other than those located on the property.

THE Concord (N. H.) Light and Power Company has just had a gas-lighting opening at its office, 90 North Main street, to show the very latest in gas-lighting appliances and to explain modern methods of lighting. Different kinds of mantles were shown and the value explained to all wishing to thoroughly understand them, and 1,000 safety gas lighters were given away. The company has also a complete stock of gas fixtures, ovens, heaters, coffee percolators, chafing dishes, gas logs, etc., in its finely equipped office.

MR. O. R. MADSEN has been retired from active service, on a pension, after serving the People's (Chicago) Gas Light and Coke Company for more than 30 years. He writes: "My retirement does not mean that I have lost all interest in the gas business. On the contrary, I am and expect to be for a long time in the ring."

UNDER a resolution passed by the board of public works, Paterson, N. J., the open flame gas lamps will be changed to Welsbach burners. At the present time there are over 400 gas lamps operated under an old contract, and it is the desire of Commissioner Doremus, who is chairman of the lighting committee, to improve conditions about the city.

THE city of Philadelphia and the United Gas Improvement Company are prepared to proceed with the work of changing 11,000 gasolene lamps to gas connections, which, with extensions consequent upon this change, would result in the United Gas Improvement Company expending upwards of $400,000, if Councils did not continue to hold up the ordinance. President Bodine, of the United Gas Improvement Company, has written Director Cooke that his company is ready to go ahead, and the director has written Mayor Blankenburg of the importance of having this work proceed, that the city may save $60,000 a year which the exchange of illuminant will make possible. Mr. Bodine agreed months ago to make the change, the ordinance was drafted and presented in Councils, and both the Mayor and President Bodine urged its passage. The Mayor is urged by Director Cooke to ask from Councils a reason for the failure to pass the bill, since all interests are agreed. The matter of giving employment to many laborers is regarded as especially important at this time.

Utilities Commission News.

CHAIRMAN OF MASSACHUSETTS COMMISSION DEAD.—Forest E. Barker, Chairman of the Massachusetts Gas and Electric Light Commission, died on the 21st inst., at Washington, D. C., where he was attending a conference of railroad, gas and electric light commissions. Mr. Barker had been a member of the Massashusetts Commission since 1885, and chairman since 1894, and was recognized throughout the United States as an expert on gas and electric matters. He was born at Exeter, N. H., 61 years ago. He graduated from Wesleyan University in 1874, and studied two years at the Boston University Law School. In 1881 he married Flora I. Hovey of Worcester, who survives him, with a son and daughter, the former Stanley D. Barker of Boston.

Mr. Barker lived several years in Worcester, moving a few years ago to Watertown. He represented a Worcester district in the House for two years prior to being appointed to the Gas and Electric Light Commission. In 1894 and 1896 he visited Europe, studying lighting conditions, by order of the Legislature. He was a high degree Mason and a life member of the Grand Council. He belonged to the Odd Fellows, Greek Letter Societies, Methodist organizations, Republican political clubs and the University Club

FRANCHISES NOT EXCLUSIVE.—A franchise does not give a light and power company the exclusive right to lay or string wires in a city's streets, according to a decision in the suit of The City of Cincinnati, Ohio, to enjoin the Diamond Light Company from crossing the city streets and from selling electrical power for commercial use. The ruling by the court covers extremely important points, and establishes a precedent upon which it is believed, by some, the monopoly held here by the Cincinnati Gas and Electric Company, and the Union Gas and Electric Company, its lessee, as well as by the Cincinnati and Suburban Bell Telephone Company, may be knocked out and a way paved whereby other corporations may get into Cincinnati. The decision sets aside the idea that a franchise is absolutely necessary before a company can supply such service, or that permission to do so must be obtained from council or the city officials. The decision holds that a monopoly of the lighting business in a city, or the furnishing of electricity for commercial purposes cannot be given to any individual or corporation, and that competition can enforce its rights, the court holding that abutting property holders have the use of the streets and highways, and where abutting property owners agree, they can lay conduits under a street, or string wires, so long as they do not interfere with the use of the street as a thoroughfare.

COMMISSION GRANTS THREE RATE INCREASES.—Authority to increase rates was granted recently by the Railroad Commission of Wisconsin, to three public utilities. The Richland Center Electric Light & Water plant is authorized to increase its rates slightly to all users, and to make a further increase to consumers outside the city limits. The Coloma Telephone Company is given permission to increase its rate from $10 per year to $11 per year, payable in advance. For less than a year the rate of $1.10 per month may be charged. In the application of Eleva Farmers' Telephone Company for permission to increase its rates the commission authorizes the company to charge $18 per year for business telephones, $15 for single party residences, $13 for two party and $12 for three-party.

Financial Notes.

THE net profit of the Denver Gas and Electric Company, for the fiscal year ending Sept. 30, was $1,408,551. Interest on bonded indebtedness amounted to $358,495, leaving $1,050,056 for dividends on stock. Virtually all of this is owned by the Cities Service Company, controlled by the Doherty interests of New York. The latter corporation suspended interest payments at the outbreak of the war. From all sources, the Denver company earned $3,378,575 for the year, of which $1,753,307 was deducted for operating expenses and taxes.

BROOKLYN UNION GAS has declared the regular quarterly of 1½ per cent. and usual semi-annual extra of 1 per cent. In its extra declaration to make the average rate paid since 1905 amount to 6 per cent. per annum, the company, including the extra dividend announced herewith, has declared a total of 7 per cent. leaving 2½ per cent. for future declaration. Dividend is payable January 2; books close December 16, reopen January 2.

KELSEY, BREWER AND COMPANY, operators of the American Public Utilities Company, announces that a dividend of one and three quarters of one per cent. has been declared on the preferred stock of the Wisconsin-Minnesota Light and Power Company, payable December 1, to stockholders of record November 17.

THE Blackstone Valley Gas and Electric Company declared a semi-annual dividend of $3 a share on the preferred stock, and a quarterly dividend of $2 a share on the common stock, both payable Dec. 1 to stock of record at close of business Nov. 24.

THE New York Public Service Commission, First District, has approved the application of the Consolidated Gas Co., for permission to issue $25,000,000 of debentures and an equal amount of capital stock to be exchanged for conversion of the bonds.

IN keeping with the many other highly favorable developments accomplished last week in the work of repairing the disorganized financial machinery, it is to be noted that upward of forty important corporations held meetings, and not one dividend reduction was announced. It was the first week since the war began in which one or more companies did not announce either reduction or the passing of regular dividends. It is calculated that dividends reduced up to this time have cost stockholders more than $26,000,000 quarterly.

APPLICATION of the Public Service Gas Company, one of the operating subsidiaries of the Public Service Corporation of New Jersey, to issue $750,000 additional capital stock has been granted by the Public Utilities Commission of New Jersey.

THE California Railroad Commission has authorized the San Diego Consolidated Gas and Electric Company to issue $250,000 6 per cent. debenture bonds, payable Dec. 1, 1922, and $240,000 common stock. The bonds are to be sold at not less than 93, and the stock at less than par.

THE Laclede Gas Light Company has declared its regular semi-annual of 2½ per cent. on preferred and regular quarterly of 1¾ per cent. on common, payable Dec. 15 to stock of record Dec. 1.

CONTENTS.

AN ASTERISK (*) DENOTES AN ILLUSTRATED ARTICLE.

*Gas Rates: Flat-Rate Unfair to Company and Consumer, by J. E. Bullard 337

*Purifier Installations, by C. E. Paige 339

Practical Educational Courses for Gas Company Employees—Salesmen, Accountants, Office Men, and Commercial Managers. 343

EDITORIALS—
Briefly Told 344
Annual Meeting. The National Civic Federation—Charge for Excess Gas—A National Utilities Bureau.

SPECIAL ENGLISH CORRESPONDENCE 345
Gas and Electric Rates at Long Eaton and Ilford—An Important Precedent—Another Law Case.

Semi-Indirect Lighting with Gas, by Mr. J. P. Hanlan 348

High Pressure Gas Lighting at the Panama-Pacific International Exposition, by A. A. Willoughby 349

*Adiabatic Calorimeter 349

NEW METHODS AND APPLIANCES 350
Tests of Flanged Fittings.

Recent Patent Issues 350

ITEMS OF INTEREST FROM VARIOUS LOCALITIES 350
Mr. Dunbar's Advancement—Heat is Neutral—Visits Plant—Reduced Street Lighting Rate—Franchise Ratified—Brenham, Tex., Extensions—A Candidate—Chattanooga, Tenn., Building—Savannah, Ga., New Office—Rollers—Removed Prepayment Meter—A Prominent Citizen—Reduced Price in Framington, Mass.—Mr. Macbeth Goes to Southern California—Strictly Business—Price Too High—Who Shall be Supplied?—A Gas Lighting Opening—Personal—Change Open Flame to Welsbach—Gasoline to Gas—And Other Items.

UTILITIES COMMISSION NEWS 352
Chairman of Massachusetts Commissien Dead—Franchises Not Exclusive—Commission Grants Three Rate Increases,

Financial Notes 352

Public Lighting Table for December, 1914..(Advertising Section) 10

Meeting Times of the Various Gas Associations " 23